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Monterey, California 93943-5138

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Compilation of Theses Abstracts

December 2004



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Naval Postgraduate School**

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PREFACE

This publication contains unrestricted abstracts (unclassified or unrestricted distribution) of theses submitted for the degrees Doctor of Philosophy, Master of Business Administration, Master of Science, and Master of Arts for the December 2004 graduation.

This compilation of abstracts of theses is published in order that those interested in the fields represented may have an opportunity to become acquainted with the nature and substance of the student research that has been undertaken. Copies of theses are available for those wishing more detailed information. The procedure for obtaining copies is outlined on the last page of this volume.

For additional information on programs, or for a catalog, from the Naval Postgraduate School, contact the Director of Admissions.

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NPS Research, a tri-annual publication highlighting faculty and student research and *Summary of Research*, an annual publication of research projects and publications, are also available on-line.

INTRODUCTION

Mission

The Naval Postgraduate School (NPS) was established to serve the advanced educational needs of the Navy. The broad responsibility of the school is reflected in its stated mission:

Increase the combat effectiveness of U.S. and allied armed forces and enhance the security of the U.S.A. through advanced education and research programs focused on the technical, analytical, and managerial tools needed to confront defense related challenges of the future.

To fulfill its mission, the Naval Postgraduate School strives to sustain excellence in the quality of its instructional programs, to be responsive to technological change and innovation in the Navy, and to prepare officers to introduce and utilize future technologies.

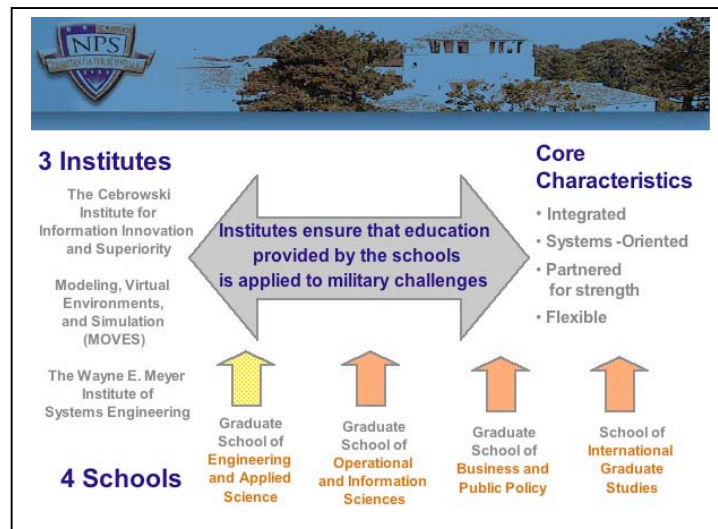
The research program at NPS exists to support the primary mission of graduate education. Research at NPS performs the following functions:

- maintains upper-division course content and programs at cutting edge
- challenges students with creative problem-solving experiences on DoD relevant issues
- advances DoN/DoD technology
- solves warfare problems
- attracts and retains quality faculty

Academic Programs

To meet its educational requirements, the Navy has developed a unique academic institution at the Naval Postgraduate School through the use of specially tailored academic programs, and a distinctive organization tying academic disciplines to naval and joint war-fighting applications.

The Naval Postgraduate School has aligned its education and supporting research programs to achieve three major goals: 1) academic programs that are nationally recognized and support the current and future operations of the Navy and Marine Corps, our sister services, and our allies; 2) institutes that focus on the integration of teaching and research in direct support of the four pillars of *Joint Visions 2010 and 2020* and their enabling technologies; and, 3) executive and continuing education programs that support continuous intellectual innovation and growth throughout an officer's career.



INTRODUCTION

Programs of graduate studies at NPS are grouped as follows:

Graduate School of Operational and Information Sciences

- Computer Science
- Computers and Intelligence (C4I) Systems
- Electronic Warfare Systems International
- Information Systems and Operations
- Information Systems and Technology
- Information Warfare
- Operations Analysis
- Operations Logistics
- Software Engineering
- Special Operations/Low-Intensity Conflict

Graduate School of Engineering and Applied Sciences

- Combat-Systems Science and Technology
- Electrical Engineering
- Electronic-Systems Engineering
- Engineering Acoustics
- Meteorology
- Meteorology and Oceanography
- Naval/Mechanical Engineering
- Oceanography
- Operational Oceanography
- Reactors/Mechanical Engineering

Graduate School of Business and Public Policy

- Acquisition and Contract Management
- Contract Management
- Defense-Systems Analysis
- Defense-Systems Management (International)
- Financial Management
- Information-Systems Management
- Leadership Education and Development
- Manpower Systems Analysis
- Material Logistics-Support Management
- Program Management
- Resource Planning and Management for International Defense
- Supply-Chain Management
- Systems-Acquisition Management
- Transportation Management

School of International Graduate Studies

- Civil-Military Relations
- Defense Decision Making and Planning
- Homeland Security Leadership Development
- International Security: Post-Conflict Security Building
- National Security and Intelligence
- Europe/Russia/Central Asia
- Far East/South-East Asia/Pacific
- Middle East/Africa/South Asia
- Western Hemisphere

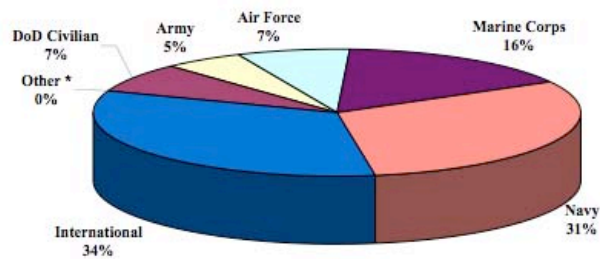
Interdisciplinary Curricula

- Modeling, Virtual Environments, and Simulation
- Product Development
- Space-Systems Engineering
- Space-Systems Operations
- Space-Systems Operations International
- Systems Engineering and Analysis
- Systems-Engineering Management
- Undersea Warfare

Students

The student body consists of U.S. officers from all branches of the uniformed services, civilian employees of the federal government, and military officers and government civilian employees of other countries. The resident degree/subspecialty student population for December 2004 is shown in Figure 1 on the following page.

INTRODUCTION



* U.S. Coast Guard, U.S. Army National Guard, U.S. Army Reserve, National Oceanographic Atmospheric Administration

Figure 1: Resident Degrees/Subspecialty Student Population, December 2004
(Total enrollment: 1,867)

Academic Degrees

Although the curricula are tailored to address defense requirements, they are developed within the framework of classical academic degrees, meeting the highest academic standards. Each curriculum leads to a master's degree; however, additional study can lead to either an engineer's degree or the doctor's degree. Below is a listing of the degrees offered at NPS:

Master of Arts Degrees

National Security Affairs
Security Studies

Master of Business Administration

Executive MBA
Master of Business Administration

Master of Science Degrees

Applied Mathematics
Applied Physics
Applied Science
Astronautical Engineering
Combat-Systems Technology
Computer Science
Contract Management
Defense Analysis
Electrical Engineering
Engineering Acoustics
Engineering Science
Information Systems and Operations
Information-Technology Management
Leadership and Human-Resource Development
Management
Materials Science and Engineering
Mechanical Engineering
Meteorology
Meteorology and Physical Oceanography
Modeling, Virtual Environments, and Simulation
Operations Research
Physical Oceanography
Physics
Product Development
Program Management

Software Engineering

Space-Systems Engineering
Space-Systems Operations
Systems Engineering
Systems Engineering and Analysis
Systems-Engineering Management
Systems Technology

Engineer Degrees

Astronautical Engineer
Electrical Engineer
Mechanical Engineer

Doctor of Philosophy Degrees

Applied Mathematics
Applied Physics
Astronautical Engineering
Computer Science
Electrical Engineering
Engineering Acoustics
Information Science
Mechanical Engineering
Meteorology
Modeling, Virtual Environments, and Simulation
Operations Research
Physical Oceanography
Physics
Software Engineering

Doctor of Engineering Degrees

Astronautical Engineering
Engineering Acoustics
Mechanical Engineering

INTRODUCTION

There were XXX degrees conferred in December 2004. Figure 2 indicates the distribution of degree type; Figure 3 indicates the degree conferred.

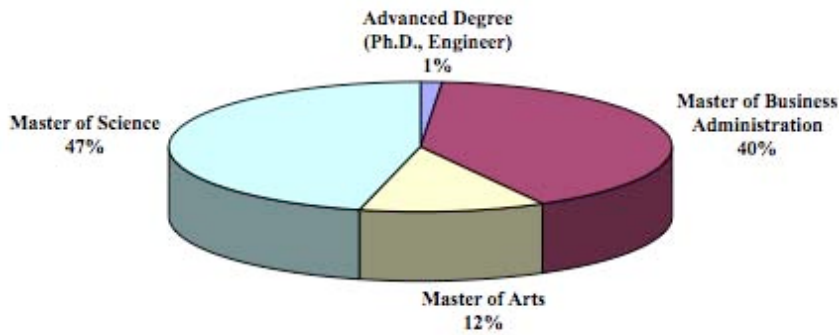
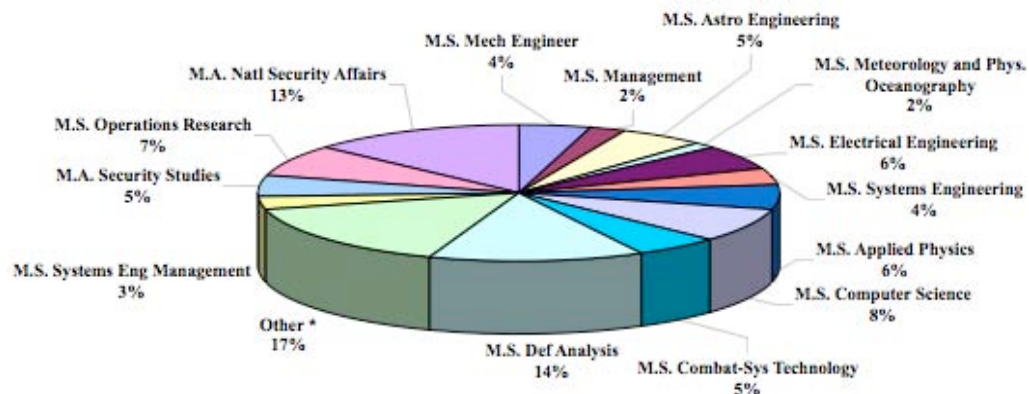


Figure 2. Distribution by Degree Type
(215 Degrees Conferred)



*Other: Ph.D. Mechanical Engineering (1), Astronautical Engineer (1), Electrical Engineer (1), M.S. Applied Science (2), M.S. Contract Management (2), M.S. Engineering Science (1), M.S. Mechanical Engineering (1), M.S. Information Technology Management (1), M.S. Meteorology (1), M.S. Modeling, Virtual Environments, and Simulation (1), M.S. Physical Oceanography (1), M.S. Product Development (1), M.S. Program Management (1), M.S. Leadership and Human-Resource Development (2)

Figure 3. Degrees Conferred in December 2004 ((215 total))

INTRODUCTION

Theses

The thesis is the capstone achievement of the student's academic endeavor at NPS. Thesis topics address issues from the current needs of the Fleet and Joint Forces to the science and technology that is required to sustain long-term superiority of the Navy/DoD.

Students, with their faculty advisors, provide a very unique capability within the DoD for addressing warfighting problems. This capability is especially important at the present time when technology in general, and information operations in particular, are changing rapidly. Our officers must be able to think innovatively and have the knowledge and skills that will let them apply technologies that are rapidly being developed in both the commercial and military sectors. Their unique knowledge of operations, when combined with a challenging thesis project which requires them to apply their focused graduate education, is one of the most effective methods for both solving Fleet/Joint Force problems and instilling the life-long capability for applying basic principles to the creative solution of complex problems.

NPS is unique in its ability to conduct classified research. Restricted theses are available on the NPS SIPRNET.

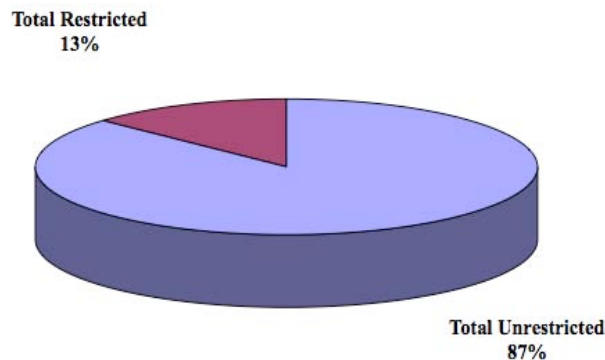


Figure 4. Classification of Theses

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ADVANCED DEGREES

**Doctor of Philosophy
Astronautical Engineer
Electrical Engineer**

DOCTOR OF PHILOSOPHY

THE ADAPTIVE CONTROL OF OPTICAL-BEAM JITTER

R. Joseph Watkins—Commander, United States Navy

B.S., Auburn University, 1983

M.S., Naval Postgraduate School, 1991

Doctor of Philosophy in Mechanical Engineering—December 2004

Advisors: Brij N. Agrawal, Department of Mechanical and Astronautical Engineering

Young Shin, Department of Mechanical and Astronautical Engineering

Acquisition, tracking, and pointing (ATP) of space- and airborne optical beams is fast becoming an important research topic as the requirements for pointing and control of the beam are increasing. Arc-second accuracy, nano-radian jitter, and large flexible structures require stringent pointing requirements, testing the limits of control systems. The equipment on board the “bus” results in narrowband as well as random structural interactions that further complicate the control method. The effect of the atmosphere on the beam adds a broadband disturbance, resulting in an optical beam that has been corrupted by “colored noise.”

In this research, a unique laser jitter-control testbed was designed and built in order to study means to correct these disturbances in an experimental laser-relay system. Several methods are implemented on the testbed, from classical control to adaptive systems, in order to develop and improve optical-beam jitter control. In adaptive control systems, the least-mean squares (LMS) and gradient-adaptive lattice (GAL) method have been used for disturbance rejection in electronic signals for years. However, these electronic signals are zero-mean, and thus the effect of bias or phase difference in the error has rarely been studied. In general, without a compensator, a slowly varying bias in the error will result in a slow convergence to the steady-state values. A phase difference between the reference signal and the error will prevent the GAL filter from removing energy in that tonal. A new technique called the adaptive-bias filter (ABF) applies a compensating bias to the reference signal for the adaptive filter, allowing rapid convergence in correcting narrowband disturbances. This technique works for both the LMS and the GAL filter, which are modified for use on the testbed. A second technique, called the adaptive-delay filter (ADF), is applied in a new way to the adaptive control systems to better correlate the error signal with the reference signal, resulting in faster convergence for low adaptation rates. Experiments using these techniques effectively demonstrate the usefulness of the new control methods, including the use of a combination linear quadratic regulator (LQR) and LMS/ABF filter to remove disturbances caused by colored noise injected into an optical beam. The combination controller results in a 38 dB decrease in jitter caused by a 50 Hz vibration and a 10 dB decrease in an 87 Hz vibration of the supporting platform, as well as an overall 75% improvement in the broadband jitter experienced by the optical beam.

KEYWORDS: Jitter Control, Optical Beams, Adaptive Control, Least Mean Square, Adaptive Lattice, Flexible Structures, Reference Signal Bias

ASTRONAUTICAL ENGINEER

MULTIPLE-SATELLITE TRAJECTORY OPTIMIZATION

Paul B. Mendy, Jr.—Major, United States Air Force

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Master of Science in Astronautical Engineering—December 2004

Astronautical Engineer—December 2004

Advisors: I. Michael Ross, Department of Mechanical and Astronautical Engineering

Donald. A. Danielson, Department of Applied Mathematics

This thesis develops and validates a satellite-trajectory optimization model. A summary is provided of the general mathematical principles of dynamic optimal control to minimize fuel consumed or transfer time. The dynamic equations of motion for a satellite are based upon equinoctial orbital elements in order to avoid singularities for circular or equatorial orbits. This study is restricted to the two-body problem, with engine thrust as the only possible perturbation. The optimal-control problems are solved using the general-purpose dynamic-optimization software, DIDO. The dynamical model, together with the fuel optimal-control problem, is validated by simulating several well-known orbit transfers. By replicating the single satellite model, this thesis shows that a multi-satellite model that optimizes all vehicles concurrently can be easily built. The specific scenario studied in this thesis involves the injection of multiple satellites from a common launch vehicle; however, the methods and model are also applicable to spacecraft formation problems.

KEYWORDS: Satellite Trajectory Control, Multi-agent Optimization, Optimal Control, DIDO, Dynamic Optimization

ELECTRICAL ENGINEER

INFRARED-IMAGING FACE RECOGNITION USING NONLINEAR KERNEL-BASED CLASSIFIERS

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Electrical Engineer—December 2004**

Master of Science in Electrical Engineering—December 2004

Committee Supervisor: Monique P. Fargues, Department of Electrical and Computer Engineering

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In recent years, there has been increased interest in effective individual control and enhanced security measures, and face-recognition schemes play an important role in this increasing market. In the past, most face-recognition research studies were conducted with visible imaging data. Only recently have infrared (IR)-imaging face-recognition studies been reported for wide-use applications, as un-cooled IR imaging technology has improved to the point where the resolution of these much cheaper cameras closely approaches that of cooled counterparts. This study is part of an ongoing Naval Postgraduate School research project investigating the feasibility of applying a low-cost un-cooled IR camera for face recognition applications. This specific study investigates whether nonlinear, kernel-based classifiers may improve overall classification rates over those obtained with linear classification schemes. The study is applied to a 50-subject IR database developed in house with a low-resolution un-cooled IR camera. Results show best overall mean classification performances around 98.55%, which represents a 5% performance improvement over the best linear-classifier results obtained previously on the same database. This study also considers several metrics to evaluate the impact of variations in various user-specified parameters on the resulting classification performances. These results show that a low-cost, low-resolution IR camera combined with an efficient classifier can play an effective role in security-related applications.

KEYWORDS: Face Recognition, Pattern Classification, Infrared, GDA, Distances, Eigenvectors

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OF
BUSINESS ADMINISTRATION**

MASTER OF BUSINESS ADMINISTRATION

IMPROVING UTILITY IN THE MARINE CORPS'S DEPOT-LEVEL MAINTENANCE PROGRAM

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The Marine Corps operates a depot-level maintenance program (DLMP) to support the continued operation of principal end items. Principal end-items require periodic induction into the DLMP. This maintenance consists of major systems overhauls aimed at extending the life cycle of the principal end-item. The frequency of these inductions is different for each end-item. The number of systems requiring induction into DLMP in a given year is always greater than the funding available in that year, resulting in a constraint. The Marine Corps attempts to optimize the utility received from the DLMP through the use of a model that considers a number of variables, resulting in a schedule for end-items to be inducted into the DLMP. This model makes the most efficient use of available funding by creating the largest increase in readiness reporting possible, given the constrained budget. The changing operational requirements, in light of current conflicts and future operations tempo, make the current DLMP process problematic. This project analyzes the current process, including the dynamic equipment-repair optimization (DERO) model, the relationship between the DERO model and the DLMP and the “human factor” decisions that go into the final implementation and execution of the DLMP. This project makes recommendations to the Marine Corps Systems Command and Marine Corps Logistics Command on a process that improves the DLMP in the long run, given the new operational environment faced as a result of the Global War on Terror.

KEYWORDS: DLMP, Depot Maintenance, War-fighting Values, Logistics, Optimization, Target Readiness, Economic Utility, Requirements Determination

INNOVATIONS IN FUNDING THE MARITIME PREPOSITIONING SHIPS PROGRAM: A CASE ANALYSIS OF HOW AND WHY THE LEASE OPTION WAS SUCCESSFUL

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The purpose of this MBA project is to research, evaluate, analyze, and provide written documentation detailing how and why the U.S. Congress, the Department of Defense, and the Department of the Navy supported and appropriated funds for the leasing of Maritime Prepositioning Ships for use in positioning troops and equipment in strategic areas of the world. This thesis explains why the lease option was eventually approved when so many participants in the decision-making process initially objected to this type of financing for shipbuilding. The result of this work provides a historical reference for the success of the lease program that can be used for future acquisitions by the United States government.

MASTER OF BUSINESS ADMINISTRATION

RETURN ON INVESTMENT IN THE PUBLIC SECTOR

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In an environment of scarce resources and rising federal deficits, the people not only expect, but also demand, greater accountability for the spending of public funds. This demand has created a trend in the public sector, not only in the United States, but worldwide as well, towards the importation of private-sector business practices to improve accountability-oriented analysis. One example is increased emphasis on return-on-investment (ROI) analysis in public-sector organizations.

Development and application of ROI analysis is challenging in the public sector, since most government organizations do not generate the profit necessary for calculation of ROI in the manner seen in the private sector. This thesis develops the methodology necessary for use of ROI analysis in the public sector. ROI methodology is applied for test evaluation with the Space and Naval Warfare Systems Command (SPAWAR) in San Diego, California. The test demonstrates that ROI can be applied successfully to assess the relative efficiency of value-added work and to improve the process of choosing between investment alternatives. Properly designed ROI analysis reveals how, and for what goods and services, money is spent, and provides a means for comparing the value derived from investment and work performed.

KEYWORDS: ROI, Return on Investment, Public Sector Finance

UNDERSTANDING ETHICAL DILEMMAS IN THE MILITARY WORKPLACE: FACTORS THAT INFLUENCE THE DECISION TO TAKE ACTION

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This study examines ethical dilemmas in the workplace and how organizational members move to resolve these challenges. Existing research is reviewed to gain insight and determine current views of ethical dilemmas experienced at work. A study is conducted with Supply Corps officers in the U.S. Navy to better understand the dilemmas they face in their daily work life. Officers are asked to think of a critical incident when they faced a moral challenge and how they responded. Data procured from critical-incident interviews is suggestive of how officers describe ethical dilemmas, how they identify options for action, and finally, how they select a course of action. The dilemmas generally involve issues with financial accountability, fairness in performance evaluations, fraternization, homosexuality in the service, employee drug and alcohol abuse, fraudulent use of government property and funds, conflict between personal and military values, and managing important relationships. This initiative, supported by the chief of the Supply Corps, is designed as a promising start toward creating an informed strategy, one that will ultimately lead to the design of enhanced educational programming regarding moral behavior in the military.

KEYWORDS: Ethical Dilemma, Managers, Workplace

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OUTSOURCING OPTIONS TO FINANCE NAVY RECAPITALIZATION

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Navy leadership is searching for ways to finance urgent fleet recapitalization, despite severely limited resources. This study exposes the scope of the recapitalization challenge, using budget forecasting and ratio analysis to frame potential trade-offs among major Navy appropriations that would achieve programmed procurement targets. Researchers illustrate the organizational and operational challenges associated with even small trade-offs, and examine the increasingly common practice of competitive sourcing using private-sector risk criteria popularized in business literature.

Research suggests that current recapitalization goals are financially untenable without significant Department of Defense (DoD) restructuring. Using a Marine Corps rescission example, it is shown that implementing the trade-offs suggested by this analysis would challenge the very way the DoD does business. However, researchers find that the early success of Sea Enterprise in identifying business efficiencies offers the best promise of success. Researchers caution that competitive sourcing must not be purely cost-driven, but rather a strategic approach to managing risk. Perspectives and considerations are offered beyond the outsourcing roadmap currently provided by OMB Circular A-76.

This study is intended for Navy leaders and other stakeholders who are evaluating the factors constraining fleet recapitalization, considering the practical ramifications of looming financing decisions and weighing the strategic and operational risks of competitive sourcing.

KEYWORDS: Outsourcing, A-76, Recapitalization, Budgeting, Cost Savings

DEVELOPING ISTANBUL INTO A REGIONAL BUSINESS HUB

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Globalization has urged many big corporations to operate in foreign countries in order to access world markets and produce at lower costs. Many countries and cities compete with each other to become business hubs in their regions in order to benefit from huge foreign direct investment (FDI) inflows. In this study, value-net analysis is used to uncover Istanbul's position and means of attracting foreign investors and strengths-weaknesses-opportunities-threats (SWOT) analysis is used to examine Istanbul's capabilities, advantages, weaknesses, threats, and opportunities on its way to becoming a regional business hub. It is found that Istanbul has great potential and many of the advantages needed to become a regional business hub for multinational corporations (MNC) that want access to the huge markets in Europe, Caucasasia, and the Middle East, as well as the emerging market of Turkey itself. However, Istanbul also possesses several weaknesses and faces several threats, causing the inward FDI flows to remain much lower than desired levels. Political and economic stability is the biggest obstacle facing Turkey (and Istanbul) in terms of attracting foreign investors. This research recommends that the government avoid populist policies and focus more on structural and economic reforms.

KEYWORDS: Foreign Direct Investment, FDI, SWOT Analysis, Value Net Analysis, MNC, Multinational Corporation, Eclectic Paradigm, Globalization, Istanbul

MASTER OF BUSINESS ADMINISTRATION

AN EVALUATION OF INDIRECT-COST-RATE DETERMINATION AT THE NAVAL POSTGRADUATE SCHOOL

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Since the Naval Postgraduate School's inception, faculty have conducted research and development for the United States Navy, its sister military services, and other agencies spread across the federal government. For its support of research efforts, NPS is reimbursed for actual costs incurred in association with providing research and development. Over the past several years, the school has experienced a significant increase in the amount of reimbursable program dollars coming into the school. Recently, school administrators questioned whether reimbursement rates charged to research customers accurately reflect the actual cost incurred in providing the service. In 2003, NPS commissioned PricewaterhouseCoopers (PwC), a well known accounting firm, to study the current rate structure and make recommendations as to what rates NPS should charge for reimbursable research and education. PwC's final report was submitted to the school in the spring of 2004. The purpose of this research project is to analyze their final report to understand the methodology and procedures PwC used to determine rates and to determine if the rate structure proposed by PwC is appropriate for implementation at NPS.

KEYWORDS: Reimbursable Research, Indirect Cost Collection, Indirect Cost Rates, Rate Determination, Appropriation Augmentation

U.S. MARINE CORPS'S EQUIPMENT-READINESS INFORMATION TOOL: USAGE AND DECISION SUPPORT FOR PERFORMANCE-BASED LOGISTICS

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The Marine Corps is transforming its automated logistics programs to meet the increasingly complex operational requirements of the 21st century. One program included in this transformation is the Marine Corps's Equipment-Readiness-Information Tool (MERIT). This research analyzes how MERIT can be used as a decision-support tool for performance-based logistics (PBL) and what areas of MERIT need improvement. Included in the analysis is a description of current readiness procedures used in the Marine Corps, which provides a point of comparison for how well MERIT enables the logistics transformation. The basis of this analysis is user perceptions, which are assessed by a user survey and focus groups. This analysis concludes that MERIT has not received official Marine Corps endorsement for its continued use; it is a valuable material-readiness information tool used by the Marine Corps; there is a general lack of understanding by users regarding MERIT's logical architecture and operation; and there is a lack of training on MERIT throughout the Marine Corps.

KEYWORDS: Marine Corps Equipment-Readiness Information Tool, MERIT, Performance-Based Logistics, PBL, Material Readiness, Global Combat Support System Marine Corps, GCSS-MC, Equipment Readiness, Material Readiness, Decision-Support Tool, Decision-Support System

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AN EMPIRICAL EXAMINATION OF THE IMPACT OF JUNIOR-RESERVE-OFFICER- TRAINING-CORPS (JROTC) PARTICIPATION ON ENLISTMENT, RETENTION, AND ATTRITION

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The focus of this project is whether participation in the Junior Reserve Officer Training Corps (JROTC) influences youths' propensity to enlist; and for those who subsequently enlist, the influence on retention rates and the propensity to reenlist. The novelty of this thesis lies in conducting multivariate analysis of the impact of JROTC participation on enlistment, retention, and reenlistment. Data sources used include the 1980 High School and Beyond (HS&B) survey and the Defense Manpower Data Center (DMDC) enlisted personnel cohort files from fiscal years 1980 to 2000.

Researchers employ a number of econometric models with the HS&B data, including single equation PROBIT and LOGIT models, two-stage least squares (2SLS) with instrumental variables, and a bivariate PROBIT equation. Results show that JROTC positively influences enlistment when JROTC participation is treated as exogenous for both high-school seniors and sophomores. The impact of JROTC participation on military-enlistment decisions becomes negligible however, when self-selection into the JROTC program of high-school students is taken into account.

Using PROBIT and LOGIT models on the DMDC data, researchers find that enlisted personnel who graduated from JROTC are more likely to reenlist than non-JROTC graduates. Using the Cox proportional-hazard-survival-analysis method, it is found that personnel who graduate from JROTC tend to stay longer and complete their first term more often than non-JROTC graduates.

Synthesizing the results, researchers conclude that policymakers might find it worthwhile to actively target JROTC cadets for enlistment because in the long run, it pays off in terms of higher first-term completion rates, which results in cost savings in the form of enlistment bonuses and training costs. One possible extension of this study is to monetize the results for a cost-benefit analysis of the JROTC program vis-à-vis other recruitment programs. Quantifying the net benefits and costs of the JROTC will allow policymakers to make more informed decisions regarding the future of the JROTC program.

KEYWORDS: Multivariate Analysis, JROTC, Recruitment, Retention, Re-enlistment, Personnel Policy

THE ADVANCED SECURITY OPERATIONS CORPORATION'S SPECIAL-WEAPONS-AND- TACTICS INITIATIVE: A BUSINESS PLAN

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This MBA project investigates and provides a comprehensive overview of the current state of affairs regarding the privatized security industry. The project focuses on a business plan that covers three phases for a start-up company to enter the private-security market. The purpose of Advanced Security Operations Corporation (ASOC) is to enter and profit from the growing privatized military industry (PMI) trend. This proposal looks at establishing a network of centralized SWAT teams whose sole mission is to train and conduct SWAT operations. These teams greatly increase the chance of success and minimize casualties, while significantly reducing cost. ASOC collaborates with local, state, and national law-enforcement agencies to maximize this innovative and value-added plan. The goal of government should be to drastically reduce the cost of redundant and inefficient services. By following the trend to outsource services and create a privately run and centrally located SWAT team, the local, state, and federal

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governments can create a long-term capability that is less expensive, yet has a greater capability for mission success. The cost effectiveness and problems/solutions faced by such an endeavor are the focus of this project.

KEYWORDS: Special Weapons and Tactics, SWAT, Homeland Security, Private Military Industry, PMI, Privatized Security, Security Industry

GOVERNMENT-IMPOSED CONSTRAINTS AND FORECASTING ANALYSIS OF THE M.J. SOFFE CORPORATION

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The purpose of this project is to evaluate the impact of the federal-requirements process on the military-sales division of the M.J. Soffe Corporation (Soffe), an apparel manufacturer, and to identify areas of influence that Soffe can control to shape the requirements of future military needs. M.J. Soffe is a main government supplier of the U.S. Marine Corps's uniform olive drab and brown crewneck undershirts. This is a study that complements M.J. Soffe's effort to understand the Federal Acquisition Regulation (FAR) and requirements process to improve their efficiency for future growth, looking at the external environment influencing the military-garment industry. An analysis of the requirements-generation process is also completed, and recommendations are made regarding opportunities for M.J. Soffe to shape future apparel requests of the military services. Furthermore, the effects of government constraints on manufacturing and sales planning are identified. This report also looks at the residual implications of this relationship towards forecast error and inventory levels.

KEYWORDS: Government Requirements Generation, Small Business Set-asides, Federal Acquisition Regulation, Forecasting Error, Demand Forecasting, Reorder Point Analysis, Safety Stock, Apparel Industry

LESSONS FOR THE DEPARTMENT OF DEFENSE FROM THE NONPROFIT

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The objective of this MBA project is to examine the nonprofit sector as a source of lessons learned for the federal government and the Department of Defense (DoD). This paper provides a characterization of the nonprofit and public sectors to identify the attributes common to both sectors. Utilizing the similarities between the sectors, researchers make the case for the nonprofit sector as an untapped source of lessons learned for the public sector and the DoD. Researchers then demonstrate the case for nonprofit organizations as a source of lessons learned, using the American Red Cross as an example, as it shares many of the same challenges as the federal government.

KEYWORDS: Nonprofit Management, Public Management, American Red Cross

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IMPACT OF ESTABLISHING THE DEPARTMENT OF HOMELAND SECURITY: MISSION AND BUDGET ANALYSIS OF THE DEPARTMENT OF DEFENSE AND OTHER GOVERNMENT AGENCIES

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The most notable impact upon the Department of Defense (DoD) in creating the Department of Homeland Security (DHS) has occurred in how DoD prepares for and provides homeland defense and homeland security. Creating the DHS produced friction for the DoD, resulting in refocused training on domestic military missions and homeland security that has reduced combat effectiveness in some units. Resource allocation throughout DoD and DHS is an area of important concern regarding long-term sustainability in the War on Terrorism. This study concludes that the current mission approach for DoD is not sustainable over the long term. Furthermore, greater fiscal responsibility in strategically funding homeland defense and homeland security needs to be exercised without compromising national security.

KEYWORDS: Department of Homeland Security Funding, Department of Defense Funding, Mission Adjustment for DoD, Homeland Security Strategy, National Deficit

PROCESS IMPROVEMENT AND INFORMATION TECHNOLOGY ILLUSTRATED THROUGH THE NAVAL-AVIATION PRODUCTION-PROCESS-IMPROVEMENT (NAPPI) AND THE FLIGHT-HOUR (FHP)/FLIGHT-HOUR-OTHER (FO) PROGRAMS

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Proper execution of appropriated funds is critical if the Navy hopes to maximize its limited resources. The Navy's Flight-Hour (FHP) and Flight-Hour-Other (FO) programs are no exception. These programs are managed by good people utilizing inefficient and outdated practices that do not adequately take advantage of the many process-change and information-technology resources available in today's Navy. This project report highlights the need for change in the FHP/FO budget management process, discusses successful process change efforts within the Navy, demonstrates the functionality of change in the FHP/FO management process through information technology, and provides a roadmap to a solution that is in alignment with the Navy's goals as outlined in *Naval Power 21...A Naval Vision*. Process change (PC) using information technology is a mandate in the DoD. Information technology can enable PC that allows more effective and efficient use of the Navy's most powerful resource: its people.

KEYWORDS: Lossless Data Compression, Discrete Mathematics, Analysis of Algorithms, Huffman Coding, Rotational Tree, Index Tree

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UPDATE OF THE *NAVY CONTRACT WRITING GUIDE*, PHASE II

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The purpose of this MBA project is to provide a comprehensive update of the *Navy Contract Writing Guide*. The project is conducted with the sponsorship and assistance of the Office of the Assistant Secretary of the Navy for Research, Development, and Acquisition. The guide was updated in December 2003 in an effort to provide organization and clear and concise solutions to current contract issues. Extensive research, incorporating interviews, websites, and regulations are utilized in updating this document. It is reorganized to better reflect actual contract writing and to address issues and solutions not previously. This guide provides a comprehensive instruction on contract writing and invaluable information relating to the most common contract issue, problem disbursements.

KEYWORDS: Contracting, DFAS, *Navy Contract Writing Guide*, Problem Disbursements, Contract Administration, Areas of Special Interest, Special Regulatory Clauses, Financial Issues

INTELLECTUAL CAPITAL

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The purpose of this MBA project is to investigate and provide a comprehensive overview of the historical and current efforts directed at valuing intellectual capital (IC). This project is conducted with the sponsorship and assistance of the Office of Military Base Retention and Reuse (OMBRR) of the California Business, Transportation, and Housing Agency. The goal of this project is to identify and document both the history of valuing IC and the models currently in use throughout the private sector. Additionally, an effort is made to develop a definition appropriate for use in a governmental setting and to develop a working model to manage IC within the Department of Defense (DoD).

KEYWORDS: Intellectual Capital, IC, Human Capital, Scorecard

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AN ANALYSIS OF THE U.S. NAVY'S MILITARY-HOUSING PRIVATIZATION INITIATIVE AND THE APPLICATION OF TRANSACTION-COST ECONOMICS AS A COMPONENT OF THE DECISION FRAMEWORK FOR THE ESTABLISHMENT OF FUTURE PARTNERSHIPS BETWEEN THE DEPARTMENT OF DEFENSE AND PRIVATE-SECTOR INDUSTRY

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The Department of Defense (DoD) has struggled with the issue of inadequate military family housing for decades. Furthermore, Congress has made numerous attempts to resolve this problem, culminating in the passage of the 1996 National Defense Authorization Act. This act allowed DoD to implement as many as twelve different authorities to meet this housing challenge, including the ability to form joint ventures with private corporations.

The Navy's innovative use of the joint-venture authority has facilitated the renovation and creation of military family housing at an unprecedented scale and pace. This study provides an overview of the Navy's use of the joint-venture authority. Additionally, the concept of transaction-cost economics is explained and applied to the Navy's contracting template for analysis.

The research concludes that the twelve authorities, especially joint ventures, have provided effective means of resolving the DoD's military-housing dilemma. Additionally, the application of transaction-cost economics proves beneficial in minimizing opportunistic behavior on the part of private partners and/or subcontracted entities.

KEYWORDS: Military Family Housing, Military Housing Privatization Initiative, Military Construction, MILCON, Privatization, Budget Scoring, Basic Allowance for Housing, BAH, Public Private Venture, PPV

AN ARENA-BASED SIMULATION ANALYSIS OF CAPACITY PLANNING FOR STAGE I OF THE VOLUNTARY-INTERMODAL-SEALIFT-AGREEMENT PROGRAM

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Passage of the Maritime Security Act of 1996 and the subsequent establishment of the Maritime Security Program (MSP) paved the way for the Secretary of Defense to approve the Voluntary Intermodal Sealift Agreement (VISA) on January 30, 1997. As an emergency-preparedness program, VISA is complemented by MSP, which provides the Department of Defense (DoD) with assured access to 47 militarily useful U.S.-flag commercial vessels such as container, roll-on/roll-off, lighter-aboard-ship (LASH), and other special-purpose ships. In return for government incentives including preference in peacetime shipping contracts and a \$2.1 million subsidy per ship per year to help defray the cost of U.S. registry, MSP carrier participants agree to offer 100 percent of their U.S.-flag vessel capacity to VISA Stage III during any

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national emergency or contingency-driven mobilization. Specifically, the concept of VISA is to augment the organic sealift capability of DoD during a contingency or war by providing assured access to time-phased, U.S.-flag commercial sealift capacity, mariners, global infrastructure, and intermodal facilities. This is achieved through pre-negotiated contracts that effectively link DoD's transportation command (USTRANSCOM), the Department of Transportation's MARAD, and the U.S. commercial maritime industry. There are two forms of VISA participants: U.S.-flag commercial carriers enrolled in MSP who receive an incentive payment or subsidy, and non-MSP, U.S.-flag commercial carriers that volunteer their capacity. Both MSP and non-MSP carriers receive preference for DoD peacetime shipping contracts. The objective of this thesis is to apply various shipping data relevant to VISA Stage I in an arena-based simulation. Specifically, the model explores capacity-planning events as they may occur during a two-major-theater war scenario and examines elements of variability and risk that may be inherent to VISA Stage I events.

KEYWORDS: VISA, Simulation Modeling, Sealift, Risk

ETHICS IN THE MILITARY: A REVIEW OF JUNIOR-OFFICER EDUCATION AND TRAINING PROGRAMS

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This purpose of this MBA project is to determine what ethics education is currently offered in the U.S. Navy and other services at the junior-officer level. The goal is to provide an informed foundation of current military best practices in ethics education, to help inform leadership about existing credible effective ethics programs or program elements. This data collection, analysis, and evaluation process will serve as the platform for establishing informed recommendations to create a future Supply Corps ethics-education program. Action-research methodology is undertaken for data collection and evaluation. Interviews are conducted with twenty-one educators at thirteen officer accession and training programs, including academies and war colleges. Analysis of each institution's ethics-education program is conducted and findings are collaboratively reviewed in order to produce a list of recommended best practices. Researchers conclude that an effective ethics program should contain, at a minimum, the following elements: precise, measurable learning objectives, relevant case studies, exposure to classical theory, honor codes, required active student participation, meaningful grading, direct involvement of senior leadership in the classroom, and the development of program-effectiveness measurements in order to evaluate the program's value, and adjust elements as necessary.

KEYWORDS: Ethics in Action, EIA, Ethics Education and Training, Navy Supply Corps, Action Research, Moral Courage, Student Researchers, Moral, Evaluation

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THE STATE OF THE ART OF BUDGETARY FINANCIAL REPORTING IN THE UNITED STATES NAVY

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The purpose of this MBA project is to determine whether a senator or representative's previous military service had any influence on how he or she supports defense appropriations. During the course of this project, four shipbuilding programs over the previous twenty years were analyzed: LCS, MCM-1, LPD-17 and DDG-51. This research shows that military experience does have a positive effect on Department of Defense appropriations at the committee level. Some senators and representatives who lack military experience actually appear to be against military spending. In both cases though, the effects of military experience were outweighed by a much larger concern. The location where a ship was actually built had a much larger effect on how much Congressional support that particular program received. Therefore, from the results of this study, one can extrapolate that where a particular program is built has a significantly greater impact on Congressional support than does prior military experience.

KEYWORDS: Congress, Military Experience, Shipbuilding

A COMPARATIVE ANALYSIS OF CURRENT AND PLANNED SMALL-ARMS WEAPON SYSTEMS

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Master of Business Administration–December 2004**

**Advisor: Brad R. Naegle, Graduate School of Business and Public Policy
Second Reader: Orin E. Marvel, Department of Information Sciences**

In today's world, the threat to the United States is no longer a symmetric enemy with massive armor formations. No longer will the battlefield of the future resemble the rolling plains of Europe. Today's enemy is more asymmetric than ever, choosing not to meet the might of the U.S. military head on, but rather in a series of small engagements against traditional non-combat arms units. Most often, the fight will take place in developed areas, where the U.S. military machine cannot bring its full force to bear on a technologically inferior foe. Each soldier, regardless of job or unit, must have an increased capability to deal with this threat. As the Army develops new or improved tactical equipment for the individual soldier to combat this threat, it must answer one key question: does the new system provide more capability and/or reduce cost? Current systems in use today are battle proven and meet this need; however, many are aging and alternative systems are available.

The purpose of this project is to determine which weapon system provides the best value to the Department of Defense. This is accomplished by examining the background, capabilities and cost of each system. A quantitative and qualitative approach is used to determine which weapon system is more advantageous in terms of suitability and effectiveness and which system provides the more cost-effective solution.

KEYWORDS: M16, M4, M249, Carbine, Rifle, SAW, Squad Automatic Weapon, Laser Aiming Light, Reflex Sight, XM8, AN/PAQ-4C, AN/PEQ-2A, M68, M145, Machine Gun

MASTER OF BUSINESS ADMINISTRATION

AN ANALYSIS OF CONSTRUCTION CLAIMS FILED WITH THE ARMED SERVICES BOARD OF CONTRACT APPEALS (ASBCA)

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Sheela Casper–First Lieutenant, United States Air Force
Master of Business Administration–December 2004
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The purpose of this research is to analyze Armed Services Board of Contract Appeals decisions over the past two years relating to disputes in United States Government construction contracts in order to identify potential weaknesses in both governmental and contractor organizations. The project identifies categories of contract disputes and patterns of contract-administration weaknesses for both the government and the contractor. The purpose is to highlight deficiencies in both governmental and contractor actions and use that information to enlighten contracting officers and preclude litigation in this area.

KEYWORDS: Contract Disputes Act, Protests, ASBCA, Construction Contract, Contract Law, Contract Claims, Contract Interpretation, Defective Specification, Termination for Default

ANALYSIS OF AN AFFORDABILITY INDEX MODEL FOR MARINE CORPS GROUND-COMBAT EQUIPMENT

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Master of Business Administration–December 2004
Melissa C. Simmons–Captain, United States Marine Corps
Master of Business Administration–December 2004
John D. Wilkerson–Captain United States Marine Corps
Master of Business Administration–December 2004
Advisors: Robert M. McNab, Defense Resource Management Institute
Kent D. Wall, Defense Resource Management Institute**

The purpose of this MBA project is to conduct an analysis of the Marine Corps Logistics Command (LOGCOM)'s proposed affordability-index (AI) model. This project is conducted with the sponsorship and assistance of LOGCOM. The goal is to analyze the validity and usability of the AI model and to recommend an alternative solution. The impetus behind the AI model is to view cost-to-readiness and to determine the return on investment (ROI) of allocating scarce maintenance funds on system sustainability.

The recommended alternative to the AI is a readiness-to-cost model. This alternative model produces a graphical depiction of readiness-to-cost over time. This model allows maintenance managers, commanders, and logistics analysts to conduct trend analysis on maintenance spending and readiness in order to plan and allocate maintenance funds and resources.

KEYWORDS: Affordability, AI, MIMMS, MARES, TAMCN, Readiness-to-Cost, TSC, UP

MASTER OF BUSINESS ADMINISTRATION

COST-EFFECTIVE ANALYSIS COMPARING THE SMALL-DIAMETER BOMB AND THE JOINT STANDOFF WEAPON (A+ VARIANT)

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Master of Business Administration—December 2004

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Master of Business Administration—December 2004

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This MBA project investigates and analyzes the cost effectiveness of implementing the Joint Standoff Weapon A+ (JSOW A+) variant versus the Small-Diameter Bomb (SDB). The primary goal is to compare the “cost per kill” for each weapon system in its intended operational environment against an existing target set. The secondary goal is to determine the most cost-effective optimum mix of weapons that would destroy the given target set. The optimum mix is determined using either the SDB or the JSOW A+ in combination with the current family of JSOW weapons. The optimum mix is calculated based upon each weapon’s cost-effectiveness. A computer model generates the cost-effectiveness of each weapon system by dividing weapon cost by weapon effectiveness. During the process of answering research questions, it is discovered that different scenarios identify JSOW A+ as comparatively more, and in several scenarios comparatively less, cost-effective than the SDB. The scenarios and results are subject to the assumptions and limitations defined within this report. This project explores the different scenarios to provide the acquisition program manager with relevant data to make informed decisions concerning the direction of their program.

KEYWORDS: Cost Effectiveness Analysis, Cost-per Kill, Small Diameter Bomb, Joint Standoff Weapon, Optimum Mix, Break-even Analysis

MARKETING THE JOINT NAVAL POSTGRADUATE SCHOOL’S SCHOOL OF BUSINESS AND PUBLIC POLICY AND THE UNIVERSITY OF MARYLAND’S ROBERT H. SMITH SCHOOL OF BUSINESS’S DEFENSE-FOCUSED MASTER OF BUSINESS ADMINISTRATION TO ACTIVE-DUTY MILITARY OFFICERS

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Master of Business Administration—December 2004

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In April 2001, the Naval Postgraduate School, Graduate School of Business and Public Policy (NPS GSBPP), and the University of Maryland (UMD)’s Robert H. Smith School of Business embarked on a joint venture to provide a defense-focused master’s degree in business administration (MBA) to military service members and Department of Defense (DoD) civilians living in the metropolitan Washington, D.C. area. This program is commonly called the joint MBA (JMBA). Through market research; strength, weakness, opportunities and threat analysis; analysis of consumer buying; and behavior and consideration of product life cycle, this marketing plan establishes an overarching marketing strategy for the JMBA. The strategy includes a product mission, marketing objectives, positioning, communication channels, the JMBA message, and a description of managing the JMBA marketing process.

KEYWORDS: Marketing Plan, SWOT Analysis, Joint MBA, Defense MBA, Naval Postgraduate School, University of Maryland, Smith School of Business and Public Policy

MASTER OF BUSINESS ADMINISTRATION

FINANCIAL MANAGEMENT IN A JOINT-FIELD ENVIRONMENT

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Master of Business Administration—December 2004

Advisors: Lawrence R. Jones, Graduate School of Business and Public Policy

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This MBA professional report highlights the financial-management challenges encountered by comptrollers in the joint-field environment, identifies sources of payment inefficiencies, and recommends solutions to reduce those inefficiencies, thus addressing the issue of improving foreign-contract payments by comptrollers in the field. Problem disbursements during Operation Desert Storm yielded \$54 million dollars in mismanaged funds for the U.S. Army alone. With the continued emphasis on joint operations, the comptroller must effectively manage funds obligated to various Department of Defense (DoD) activities.

This research endeavor includes doctrine and policy review, interviews with various DoD comptrollers, and a case study of exercise Cobra Gold 2002 budget execution and contractual payments at the joint-organizational level. Cobra Gold is an excellent example of a large-scale joint and combined operations in a foreign country; it provides a great opportunity to analyze the research question. This report concludes that field comptrollers cannot adequately meet fiscal responsibilities without comparable garrison IT connectivity and recommends that all of the U.S. services procure systems that are fully interoperable to best support the warfighter. This report is primarily intended for field comptrollers with limited joint-field experience, to make them aware of the unique nature of joint operations.

KEYWORDS: Financial Management, Comptroller, Unmatched, Disbursements, Defense Finance and Accounting System, Foreign Vendor Contract Payments, Cobra Gold

LOGISTICS SUPPORT OF NAVAL EXPEDITIONARY UNITS

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Master of Business Administration—December 2004

Joel R. Tessier—Lieutenant Commander, United States Navy

Master of Business Administration—December 2004

John S. Lugo—Lieutenant Commander, United States Navy

Master of Business Administration—December 2004

Robert D. Perez—Lieutenant Commander, United States Navy

Master of Business Administration—December 2004

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Keebom Kang, Graduate School of Business and Public Policy

E. Cory Yoder, Graduate School of Business and Public Policy

This project assesses the U.S. Naval Forces Central Command (NAVCENT) logistics system as it relates to support of naval expeditionary units such as Naval Construction Forces (NCF), Naval Special Warfare (NSW) forces, Explosive Ordnance Disposal (EOD) units and fleet hospitals. Based on literature from strategic management, logistics, and supply-chain management, the research evaluates the existing theater logistics capabilities and the requirements of the supported expeditionary units. Due to the current world situation and availability of information, this research focuses on NAVCENT's area of responsibility (AOR). A key finding is that NAVCENT's logistics system is adequate, but inefficient. Adequacy points to the fact that the resources and capabilities are in place in theater, while inefficiencies are explained by lack of execution. The report recommends increased integration, awareness, and doctrinal understanding in order to improve the NAVCENT logistics system. Sponsorship is provided by the Naval Operational Logistics Support Center, a newly created organization that serves as the focal point for operational logistics in the Navy and Marine Corps.

KEYWORDS: Naval Expeditionary Logistics Support, NAVCENT Logistics, Naval Logistics for Shore Based Units, Organizational Systems Framework, Naval Special Warfare, Naval Construction Force, Explosive Ordnance Disposal, Fleet Hospital

MASTER OF BUSINESS ADMINISTRATION

THE IMPACT OF COMMODITY COUNCILS ON THE INTERNAL STRUCTURES OF PURCHASING ORGANIZATIONS IN THE UNITED STATES AIR FORCE

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Master of Business Administration-December 2004**

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Master of Business Administration-December 2004**

**Advisors: R. Marshall Engelbeck, Graduate School of Business and Public Policy
Raymond E. Franck, Graduate School of Business and Public Policy**

To better support the warfighter, the Department of Defense is emulating industry's best commercial practices (BCP). Identified as a BCP, strategic sourcing is an integral part of the procurement transformation, aimed at buying products cheaper and faster. Success in the commercial industry has shown that strategic sourcing is a powerful tool that can significantly cut costs and improve customer responsiveness. The Air Force has taken initial steps to implement strategic sourcing into their purchasing organizations through commodity councils. This research uses the case study method to identify patterns and trends experienced by commercial companies in their implementation of strategic sourcing. In particular, this research focuses on job description, training, manpower, realignment, procedures, and human aspects. Further analysis compares these "lessons learned" to current Air Force practices and discusses potential barriers and to what extent they can be adopted. Based on these findings, specific recommendations are made to better help the Air Force enable this transformation.

KEYWORDS: Commodity Council, Contracting, Strategic Purchasing, Strategic Sourcing, Procurement, Organizational Change, Air Force, Supply-Chain Management

ANALYSIS OF EARLY-SEPARATION-INCENTIVE OPTIONS TO SHAPE THE NAVAL FORCE OF THE FUTURE

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Master of Business Administration-December 2004**

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John E. Muttly, Graduate School of Business and Public Policy**

The Navy has several tools at its disposal to shape the force, including early-separation incentives. This analysis looks at the issues surrounding separation incentives, including the discount rate for government use, the discount rate used by individuals to make a decision (personal discount rate), comparable civilian sector wages for separating personnel, promotion probabilities, and the costs to the government of maintaining personnel until retirement. Using the information provided from researching these topics, a model is created to identify the present value of retirement payments for officers in the Navy given their current rank, age, and years of service. The model provides a maximum amount the government should be willing to offer to voluntarily separate an officer prior to retirement. This model is compared to a second model, which determines the minimum amount an officer would be willing to accept to voluntarily separate before retirement. Based on data generated from the model, recommendations are provided for future methods of shaping the force to maximize savings to the Navy.

KEYWORDS: Separation Incentives, Annuities, Force Reduction, Cost Benefit Analysis, Government Discount Rate, Civilian Sector Wages, Retirement Compensation, Personal Discount Rate, Military Compensation

MASTER OF BUSINESS ADMINISTRATION

EXPENDITURE TRACKING AS A PERFORMANCE-MEASUREMENT SYSTEM

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Master of Business Administration–December 2004

Jason E. Klingenberg–Lieutenant, United States Navy

Master of Business Administration–December 2004

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Mary Malina, Graduate School of Business and Public Policy

CDR Philip J. Candreva, USN, Graduate School of Business and Public Policy

Operating as a reorganized command resulting from a large Naval Special Warfare (NSW) community-wide reorganization called NSW-21, Naval Special Warfare Group One (NSWG-1) identified a significant budgeting challenge. In late-calendar-year 2001, while NSWG-1 was working out the initial financial ramifications of its new organization, the Global War on Terrorism (GWOT) began. With the GWOT came extraordinarily large supplemental appropriations. These appropriations helped subsidize some of NSWG-1's new funding needs. Thus, NSWG-1 recognized it might face a future funding deficit if and when supplemental appropriations are discontinued.

As a result, the NSWG-1 leadership formed a budget team to determine how to scrutinize the normal year budget more closely to find discretionary funding for emergent needs. They executed improvements to NSWG-1's expenditure tracking system to capture more specific expenditure data upon which to base future spending decisions and to establish a new baseline of normal, post-transition needs. The purpose of this project is to document and analyze the improvements NSWG-1 made to its expenditure tracking system and how it serves as a performance-measurement system.

KEYWORDS: Performance Measurement and Control Systems, Cybernetic Feedback Model, Financial Management

MEDICAL-EQUIPMENT MANAGEMENT THROUGH THE USE OF RADIO-FREQUENCY IDENTIFICATION (RFID)

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Sergio Chávez–Lieutenant, United States Navy

Master of Business Administration–December 2004

Richard A. Nixon–Lieutenant, United States Navy Reserve

Master of Business Administration–December 2004

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Second Reader: Ira Lewis, Graduate School of Business and Public Policy

The purpose of this project is to identify the potential value of radio-frequency identification (RFID) use in the management of medical equipment at Naval Medical Center San Diego (NMCS). This project seeks to derive potential benefits through the use of RFID technology by comparing a group of medical-equipment items that are tracked within NMCS. The project includes a discussion of additional potential uses of RFID infrastructure within the military healthcare system and possible resulting benefits. The project determines the financial viability and practicality of implementing RFID.

KEYWORDS: Radio Frequency Identification, Medical Equipment Management

MASTER OF BUSINESS ADMINISTRATION

UPDATE OF THE NAVY CONTRACT WRITING GUIDE, PHASE III: CREATION OF ADDENDUM ADDRESSING DD-1716 CONTRACT DEFICIENCIES

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Master of Business Administration—December 2004

Advisors: E. Cory Yoder, Graduate School of Business and Public Policy

Ron B. Tudor, Graduate School of Business and Public Policy

The purpose of this MBA project is to provide an update of the *Navy Contract Writing Guide (NCWG)* by creating an addendum that specifically addresses contract deficiencies (i.e., contract errors) and offers some tools to help users remedy existing contract deficiencies and avoid future contract deficiencies in the writing of contracts. The project is conducted with the sponsorship and assistance of the Office of the Assistant Secretary of the Navy for Research, Development and Acquisition, in conjunction with the Defense Finance and Accounting Service, Columbus, Ohio. The guide was updated in December 2003 and again in June 2004 in an effort to provide organization and clear and concise solutions to current contract issues. This effort is viewed as a continuation of these previous efforts to improve the quality and effectiveness of the *NCWG*. Extensive research, incorporating interviews, websites, and regulations are utilized in creating this addendum to the *NCWG*.

KEYWORDS: Contract Deficiencies, Contract Errors, DD-1716 Contract Deficiency Report, Prompt Payment Interest

UBIQUITOUS POWER; OPPORTUNITIES AND BENEFITS OF THE PHOTOVOLTAIC POWER CONVERTER FOR THE INDIVIDUAL WAR FIGHTER

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The success of every military throughout history has resided in its ability to move, shoot, and communicate, all of which require power. In the modern era, technology has afforded soldiers equipment that greatly enhances maneuverability through state-of-the-art communications equipment. Such equipment creates significant power needs that are currently met through the use of expensive and heavy disposable and rechargeable batteries. The limitation for improved complex communications, as well as weapon systems, is the ability to power such systems. The problem with alternative power sources is their inefficiency, unreliability and inconvenience. This project provides an analysis of a new ubiquitous power source (a photovoltaic power converter) and the opportunities it can afford to individual soldiers in meeting existing power requirements. This paper calculates the savings and reports on critical user needs of the individual war fighter.

KEYWORDS: Solar Power, Photovoltaic, Rechargeable Batteries, Atira, PVPC

MASTER OF BUSINESS ADMINISTRATION

LOGISTICAL IMPACT STUDY OF PHOTOVOLTAIC POWER-CONVERTER TECHNOLOGY TO THE UNITED STATES ARMY AND UNITED STATES MARINE CORPS

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Master of Business Administration–December 2004

Jason A. Hamilton–Captain, United States Marine Corps

Master of Business Administration–December 2004

Steve A. Sablan–Captain, United States Marine Corps

Master of Business Administration–December 2004

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Donald R. Eaton, Graduate School of Business and Public Policy

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The purpose of this project is to analyze the logistical and fiscal impact of replacing selected disposable batteries with rechargeable batteries and photovoltaic-power-converter chargers within Army and Marine Corps infantry battalions. This project is conducted with the sponsorship and assistance of the XVIII Airborne Corps, Marine Corps Systems Command, Fleet Numerical, and the Defense Advanced Research Projects Agency. The goal is to identify how this new technology could be incorporated into current combat gear and what impact such incorporation would have in decreasing the infantryman's combat load, reducing expenditures on batteries, and relieving the overall logistical burden for the subject services.

KEYWORDS: Photovoltaic Power Converter Technology, Rechargeable Battery, Disposable Battery, BA-5590, ATIRA

MASTER OF SCIENCE

Applied Physics

Applied Science

Astronautical Engineering

Combat-Systems Technology

Computer Science

Contract Management

Defense Analysis

Electrical Engineering

Engineering Science

Information-Technology Management

Leadership and Human-Resource Development

Management

Mechanical Engineering

Meteorology

Meteorology and Physical Oceanography

Modeling, Virtual Environments, and Simulation

Operations Research

Physical Oceanography

Product Development

Systems Engineering

Systems-Engineering Management

MASTER OF SCIENCE IN APPLIED PHYSICS

PRINCIPAL-COMPONENTS-BASED TECHNIQUES FOR HYPERSPECTRAL IMAGE DATA

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Electrical Engineer, 2001

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M.S., Naval Postgraduate School, 2001

Master of Science in Applied Physics—December 2004

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Principle components (PC) and minimum-noise fraction (MNF) transforms are two methods widely used for various applications, such as dimensionality reduction, data compression, and noise reduction. In this thesis, an in-depth study of these two methods is conducted in order to estimate their performance in hyperspectral imagery.

First, the PCA and MNF methods are examined for their effectiveness in image enhancement. Also, the various methods are studied to evaluate their ability to determine the intrinsic dimension of the data. Results indicate that in most cases, the scree test gives the best measure of the number of retained components, as compared to the cumulative variance, the Kaiser and the CSD methods.

Then, the applicability of PCA and MNF for image restoration is considered using two types of noise, Gaussian and periodic. Hyperspectral images are corrupted by noise using a combination of ENVI and MATLAB software, while the performance metrics used for evaluation of the retrieval algorithms are visual interpretation, RMS-correlation coefficient spectral comparison, and classification. In Gaussian noise, the retrieved images using inverse transforms indicate that the basic PC and MNF transform perform comparably. In periodic noise, the MNF transform shows less sensitivity to variations in the number of lines and the gain factor.

KEYWORDS: Remote Sensing, Hyperspectral Imagery, Principal Components Analysis, Minimum Noise Transform

ALTERNATE CONFIGURATIONS FOR BLOCKED-IMPURITY-BAND DETECTORS

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Silicon blocked-impurity-band (BIB) detectors are highly efficient, radiation-hardened photodetectors that operate in the range of 5-40 μm . To further extend BIB coverage to 40-350 μm , Ge and GaAs BIB detectors are under development; however, these new detectors face fabrication issues that have delayed their introduction. This thesis describes the use of a numerical model to examine alternate operating modes for GaAs BIB detectors in order to bypass current fabrication issues. The numerical simulations provide an understanding of the fundamental physics that govern detector transport. The proposed alternatives to standard operation are created by reversing the detector's bias and varying the blocking layer thickness. Modeling indicates that reversing the bias on these detectors provides a larger signal current than standard configurations, while preserving the principal benefits gained from a multilayered device. At the same time, the alternate bias configuration allows for the use of thicker blocking layers, while preserving overall detector responsivity and reducing shot noise. This proposed new model of operation should allow for the

relaxation of fabrication constraints without sacrificing the inherent benefits associated with BIB detectors. These devices are of potential interest for missile defense and terahertz surveillance applications.

KEYWORDS: Blocked Impurity Band, BIB, Impurity Band Conduction, IBC, Infrared Detector, Infrared Sensors, Long Wavelength Infrared, LWIR, Very Long Wavelength Infrared, VLWIR

DESIGN OF TWO-AXIS CAPACITIVE ACCELEROMETER USING MEMS

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Second Reader: Jose Sinibaldi, Department of Mechanical and Astronautical Engineering

MEMS technology plays an important role in current and future military systems. MEMS are able to lower the device size from millimeter to micrometer and maintain and sometimes surpass the performance of conventional devices. This thesis encompasses the knowledge acquired throughout the MEMS courses to design a two-axis capacitive accelerometer. The required acceleration and operating temperature range are $\pm 50g$ in each axis and -40°C to $+80^{\circ}\text{C}$, respectively. The accelerometer also needs to survive within a dynamic shocking environment with accelerations of up to $225g$. The parameters of the accelerometer to achieve above specifications are calculated using lumped element approximation and the results are used for initial layout. A finite element-analysis code (ANSYS) is used to perform simulations of the accelerometer under various operating conditions and to determine the optimum configuration. The simulated results are found to be within about 5% of the calculations, indicating the validity of lumped element approach. The response of the designed accelerometer is 7 mV/g , with sensitivity of $1.3g$ at 3dB . It is also found that the accelerometer is stable in the desired range of operation, including under the shock. Two axes sensing can be achieved using two identical accelerometers having their sensing axes perpendicular to each other.

KEYWORDS: Capacitive Accelerometer, MEMS

IMPROVEMENT OF AN ACOUSTIC SOUNDER DEVICE USED TO MEASURE ATMOSPHERIC TURBULENCE

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Master of Science in Applied Physics—December 2004

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Thomas J. Hoffer, Department of Physics

Optical turbulence plays an important role in the propagation of electromagnetic waves through the atmosphere because it broadens and distorts the optical beam. A variety of optical, thermal, and acoustic instruments are used to detect the atmospheric turbulence, and an acoustic echosounder proves to be a valuable tool to probe the fine dynamic structure of atmospheric turbulence within the first hundred meters above the surface.

The first planar acoustic echosounder constructed at the Naval Postgraduate School was by Weingartner and Wroblewski, under the supervision of Walters. Moxcey later modified this design by reducing the number of drivers from 25 to 19 and placing the drivers closer together into a hexagonal, close-packed array. Although the acoustic echosounder works well, there are problems with resonances and ringing in the current choice of transducers. This thesis explores the potential sources of the transducer ringing and implements solutions to the problem. Additionally, the receiving sensitivity of the echosounder is improved and the electronics noise when receiving is lowered. Finally, these techniques are applied to another array assembled with new drivers to improve its performance compared to the previous echosounder array, while measuring and quantifying the level of improvement achieved.

KEYWORDS: Acoustic Echosounder, Acoustic Sounder, Transducer

INFRARED CHARACTERIZATION OF SiN FILMS ON Si FOR HIGH-SPEED ELECTRONICS APPLICATIONS

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Master of Science in Applied Physics–December 2004

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Second Reader: Ronald E. Brown, Department of Physics

In this thesis, SiN films grown on Si substrates are characterized using Fourier-transform-infrared (FTIR) spectroscopy. The stress in SiN films is used to enhance the mobility of electrons and holes, which increases the performance of metal-oxide-semiconductor (MOS) transistors. The samples used in this study are prepared by Applied Materials using a chemical vapor deposition (CVD) technique with different growth parameters. The stress of the samples varies from 1.3 GPa compressive to 1 GPa tensile, depending on the growth conditions employed. The FTIR measurement shows three distinct absorption peaks associated with Si-N, Si-H and N-H vibrational modes. The hydrogen is unintentionally incorporated into the SiN film during the CVD process due to its use as the carrier gas for the precursors. It is found from the FTIR data that the area under Si-H and N-H peaks (amount of bonds) varies in opposite directions when the film stress changes from compressive to tensile. In addition, the peak position of the Si-H absorption shifts to higher energy while the opposite is true for N-H as the stress changes from compressive to tensile. The strength and the position of the Si-N absorption peak are found to be relatively insensitive to the stress of the film. This indicates that the amount of Si-H and N-H bonds in the film is responsible for controlling the stress of the film. The use of quantum calculation of SiN molecules with different amounts of Si-H and N-H bonds is used toward understanding the experimental absorption spectra.

KEYWORDS: Electron Mobility, Effective Mass, Stress-strain, MOS, FTIR, SiN Films

A HIGH RESPONSIVITY, TUNABLE, STEP QUANTUM-WELL INFRARED PHOTODETECTOR

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Master of Science in Applied Physics–December 2004

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Second Reader: James Luscombe, Department of Physics

This thesis evaluates the performance of a step quantum-well infrared photodetector (QWIP) designed to detect a laser spot at $1.05\ \mu\text{m}$ and IR radiation between 9.5 to $10.5\ \mu\text{m}$. In the far infrared (FIR), the maximum responsivity of the test detector at 10 K is measured at $1.02\ \text{A/W}$ with a peak wavelength of $10.3\ \mu\text{m}$ under a negative bias of $0.83\ \text{V}$. The D^* at background limited infrared performance (BLIP) is measured at $8.0 \times 10^9\ \text{cm}^2/\text{Hz}/\text{W}$ with 180° field of view. The BLIP temperature is found to be about 55 K. In addition, the FIR detection wavelength finds shift with the amount of bias across the device. The amount of shift observed is $0.21\ \text{meV/KVcm}^{-1}$, which is due to linear Stark effect associated with the step quantum well. An order-of-magnitude-lower Stark shift originating from second-order effects was found in quantum-well infrared detectors made of square quantum wells. This suggests that the step-well infrared detector can have applications in tunable-wavelength infrared detectors.

KEYWORDS: Asymmetric Quantum Well, Step Quantum Well Infrared Photodetector, Stark Effect

MASTER OF SCIENCE IN APPLIED SCIENCE

A SIMULATION STUDY OF THE ERROR INDUCED IN ONE-SIDED RELIABILITY- CONFIDENCE BOUNDS FOR THE WEIBULL DISTRIBUTION, USING A SMALL SAMPLE SIZE WITH HEAVILY CENSORED DATA

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Budget limitations have reduced the number of military components available for testing and time constraints have reduced the amount of time available for actual testing, resulting in many items still operating at the end of test cycles. These two factors produce small test populations (small sample size) with heavily censored data. The assumption of normality for estimates based on these small sample sizes reduces the accuracy of confidence bounds of the probability plots and the associated quantities. This creates a problem in acquisition analysis because the confidence in the probability estimates influences the number of spare parts required to support a mission or deployment or determines the length of warranty ensuring proper operation of systems. This thesis develops a method that simulates small samples with censored data and examines the error of the Fisher matrix (FM) and the likelihood-ratio-bounds (LRB) confidence methods of two test populations (sized 10 and 20) with three, five, seven, and nine observed failures for the Weibull distribution. This thesis includes a Monte Carlo simulation code written in S-Plus that can be modified by the user to meet his particular needs for any sampling and censoring scheme. To illustrate the approach, the thesis includes a catalog of corrected confidence bounds for the Weibull distribution, which can be used by acquisition analysts to adjust their confidence bounds and obtain a more accurate representation for warranty and reliability work.

KEYWORDS: Weibull Distribution, Simulation Study, Confidence Interval, Small Sample Size, S-Plus, Monte Carlo Simulation

MASTER OF SCIENCE IN ASTRONAUTICAL ENGINEERING

A HYPERVELOCITY IMPACT ANALYSIS OF INTERNATIONAL SPACE-STATION WHIPPLE AND ENHANCED STUFFED WHIPPLE SHIELDS

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Master of Science in Astronautical Engineering—December 2004

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The International Space Station (ISS) must be able to withstand the hypervelocity impacts of micrometeoroids and orbital debris that strike its many surfaces. In order to design and implement shielding which will prevent hull penetration or other operational losses, the National Aeronautics and Space Administration (NASA) must first model the orbital debris and micrometeoroid environment. Based upon this environment, special multi-stage shields called Whipple shields and enhanced stuffed Whipple shields are developed and implemented to protect ISS surfaces. Ballistic limit curves that establish shield failure criteria are determined via ground testing. These curves are functions of material strength, shield spacing, projectile size, shape and density, as well as a number of other variables. The combination of debris model and ballistic limit equations allows NASA to model risk to ISS using a hydro-code called BUMPER. This thesis modifies and refines existing ballistic limit equations for U.S. laboratory module shields to account for the effects of projectile (debris/micrometeoroid) densities. Using these refined ballistic limit equations, this thesis also examines alternative shielding materials and configurations to optimize shield design for minimum mass and maximum stopping potential and proposes alternate shield designs for future NASA ground testing. This thesis provides the Department of Defense with a background in satellite-shield theory and design in order to improve protection against micrometeoroid and orbital debris impacts on future space-based national systems.

KEYWORDS: Orbital Debris, Hyper-velocity Impact, International Space Station, Whipple Shield, Enhanced Stuffed Whipple Shield, NASA, Ballistic Limit Equations

DEVELOPMENT OF A CONTROL-MOMENT-GYROSCOPE-CONTROLLED THREE-AXIS SATELLITE SIMULATOR, WITH ACTIVE BALANCING FOR THE BIFOCAL-RELAY- MIRROR INITIATIVE

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This thesis develops and implements a control-moment-gyroscope (CMG) steering law, controller, and active-balancing system for a three-axis satellite simulator (TASS). The CMGs are configured in a typical pyramid configuration (the fourth CMG position being null). The development is done primarily with simulation and experiments utilizing Real Time Workshop and XPC Target of MATLAB and SIMULINK.

ASTRONAUTICAL ENGINEERING

masses in the three body axes for balancing, which actively eliminates any center-of-gravity (CG) offset and returns the CG to the CR. The TASS supports an optics payload designed to acquire, track, and point a received laser beam onto an off-satellite target. The target may be stationary or moving. Actively balancing the TASS reduces the torque output requirement for the CMGs while maintaining either a stabilized level platform or a particular commanded attitude. Reduction or elimination of torque output from the CMGs results in a more stabilized platform, less structurally induced vibration, less jitter in payload optics, and less power required in spacecraft applications.

KEYWORDS: Satellite Simulator, Active Balancing, Auto Balancing, Control Moment Gyroscope, CMG, Air Bearing

NUCLEAR-POWER SYSTEMS FOR HUMAN MISSIONS TO MARS

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Nuclear power is the next enabling technology in manned exploration of the solar system. Scientists and engineers continue to design multi-megawatt power systems, yet no power system in the 100 kilowatt electric range has been built and flown. Technology demonstrations and studies present a myriad of systems from which decision makers can choose to build the first manned space nuclear-power system. While many subsystem engineers plan in parallel, an accurate specific-mass value becomes an important design specification that is still uncertain. This thesis evaluates the design features of the manned Mars mission, its power-system requirements, their design attributes and their design faults. Specific mass for 1-15MWe systems is calculated statistically as well as empirically. Conclusions are presented on each subsystem. Recommendations are presented on where development needs to begin today in order to launch a mission in the future.

KEYWORDS: Space Nuclear Power, Mars, Manned Mars Mission, Nuclear Electric Propulsion, Specific Mass, Space Reactor, Space Power, Space Power Systems

MULTIPLE-SATELLITE TRAJECTORY OPTIMIZATION

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This thesis develops and validates a satellite-trajectory-optimization model. A summary is provided of the general mathematical principles of dynamic optimal control to minimize fuel consumed or transfer time. The dynamic equations of motion for a satellite are based upon equinoctial orbital elements in order to avoid singularities for circular or equatorial orbits. This study is restricted to the two-body problem, with engine thrust as the only possible perturbation. The optimal-control problems are solved using the general-purpose dynamic optimization software, DIDO. The dynamical model, together with the fuel optimal-control problem, is validated by simulating several well-known orbit transfers. By replicating the single satellite model, this thesis shows that a multi-satellite model that optimizes all vehicles concurrently can be easily built. The specific scenario studied in this thesis involves the injection of multiple satellites from a common launch vehicle; however, the methods and model are also applicable to spacecraft formation problems.

KEYWORDS: Satellite Trajectory Control, Multi-agent Optimization, Optimal Control, DIDO, Dynamic Optimization

DIRECT-CONNECT PERFORMANCE EVALUATION OF A VALVELESS PULSE- DETONATION ENGINE

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Operational characteristics of a valveless pulse-detonation engine system are characterized by experimental measurements of thrust, fuel flow, and internal gas dynamics. The multi-cycle detonation experiments are performed on an axis-symmetric engine geometry operating on ethylene/air mixtures. The detonation diffraction process from a small “initiator” combustor to a larger-diameter main combustor in a continuous airflow configuration is evaluated during multi-cycle operation of a pulse-detonation engine and is found to be very successful at initiating combustion of the secondary fuel/air mixture at high frequencies. The configuration is used to demonstrate the benefit of generating an overdriven detonation condition near the diffraction plane for enhanced transmission of the larger combustor. Results show that the addition of optical sensors, such as tunable diode lasers, to provide fuel profile data are invaluable for providing high-fidelity performance results. The performance results demonstrate the ability of the valveless pulse-detonation engine to run at efficiencies similar to valved pulse-detonation engine geometries and may be a low-cost alternative to conventional air-breathing propulsion systems.

KEYWORDS: Pulse Detonation Engine, Supersonic Air Breathing, Engine Performance Evaluation

MASTER OF SCIENCE IN COMBAT-SYSTEMS TECHNOLOGY

FUSION OF IMAGES FROM DISSIMILAR SENSOR SYSTEMS

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Different sensors exploit different regions of the electromagnetic spectrum; therefore, a multi-sensor image-fusion system takes full advantage of the complementary capabilities of individual sensors in the suit to produce information that cannot be obtained by viewing the images separately. In this thesis, a framework for the multi-resolution fusion of night-vision devices and thermal-infrared imagery is presented. It encompasses a wavelet-based approach that supports both pixel-level and region-based fusion and aims to maximize scene content by incorporating spectral information from both the source images. In pixel-level fusion, source images are decomposed into different scales and salient directional features are extracted and selectively fused together by comparing the corresponding wavelet coefficients. To increase the degree of subject relevance in the fusion process, a region-based approach which uses a multi-resolution segmentation algorithm to partition the image domain at different scales is proposed. The region's characteristics are then determined and used to guide the fusion process. The experimental results obtained demonstrate the feasibility of the approach. Potential applications of this development include improvements in night piloting (navigation and target discrimination), law enforcement, etc.

KEYWORDS: Image Fusion, Wavelet Transform Fusion, Region-based Fusion

DETECTING NEAR-UV AND NEAR-IR WAVELENGTHS USING THE FOVEON IMAGE SENSOR

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Traditionally, digital imaging systems rely on the use of dedicated photodetectors to capture specific wavelengths in the visible spectrum. These photodetectors, which are commonly made of silicon, are arranged as arrays to capture the red, green, and blue wavelengths. The signal captured by the individual photodetectors must then be interpolated and integrated to obtain the closest color match and the finest possible resolution with reference to the actual object. The use of spatially separated detectors to sense primary colors reduces the resolution by a factor of three, compared to black-and-white imaging. The FOVEON detector technology greatly improves the color and resolution of the image through its vertically arranged, triple-well photodetector. This is achieved by exploiting the variation of absorption coefficient of silicon with wavelength in the visible spectrum. Hence, in a silicon detector, the shorter wavelength (e.g. blue) is mainly absorbed at a shallow depth. A longer wavelength (e.g. red) penetrates the material deeper than the shorter wavelengths and is primarily absorbed at a greater depth. By producing a layered silicon detector, all three primary color wavelengths of red, green, and blue are captured simultaneously. This thesis studies the FOVEON camera's ability to image light from the near infrared (NIR) to the ultraviolet (UV) range of the electromagnetic spectrum. The images obtained using a set of band-pass filters show that the camera responds both in the UV and NIR regions.

KEYWORDS: Silicon, Photodetector, FOVEON, CMOS, CCD, Detectivity, Responsivity, Triple-well, Color Perception, Metamerism, Image Resolution, Atmospheric Absorption, Spectral Reflectance, Digital Imaging

BATTLE-DAMAGE ASSESSMENT USING INVERSE-SYNTHETIC-APERTURE RADAR (ISAR)

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An imaging radar, like an inverse-synthetic-aperture radar (ISAR), offers a combatant the ability to perform long-range surveillance with high-quality imagery for positive target identification. Extending this attractive feature to the battle-damage assessment problem (BDA) gives the operator instant viewing of the target's behavior when hit. As a consequence, immediate and decisive action can be quickly taken if required. However, the conventional Fourier processing adopted by most ISAR systems does not provide adequate time resolution to capture the target's dynamic responses during the hit. As a result, the radar image becomes distorted. To improve the time resolution, time-frequency transform (TFT) methods of ISAR imaging are proposed. Unlike traditional Fourier-based processing, TFT's methods allow variable time resolution of the entire event that falls within the ISAR coherent-integration period to be extracted as part of the imaging process. This thesis shows that the use of linear short-time-frequency transforms allows the translational response of the aircraft caused by a blast force to be clearly extracted. The TFT-extracted images show how the aircraft responds to a blast effect and also provide additional information about the cause of image distortion in the traditional ISAR display.

KEYWORDS: ISAR, Radar Imaging, Time Frequency, Image Processing, High Resolution Radar, Battle Damage Assessment, BDA

EVALUATION OF NIGHT-VISION DEVICES FOR IMAGE-FUSION STUDIES

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Night-vision devices (NVD) using image-intensification (II) technology are among the most important sensors used by ground troops and aviators in night operations for modern combat. With the intensified images from these devices, soldiers can see enemy movement better and farther in darkness. This thesis explores different test methods in evaluating the performances and sensitivities of several NVDs for future image fusion studies. Specification data such as sensitivity, resolution (modulation-transfer function), and pixel size are obtained. Comparative analyses of the collected results are made to characterize the performances of the different NVDs. A new method using MATLAB programming to objectively analyze digitized images for characterization of II-based NVDs is proposed. This test method can also be extended to the evaluation of thermal-imaging (TI) systems for comparative analysis with II NVDs. In addition, the feasibility of testing NVDs using both II and TI technologies with common operating conditions and target boards is discussed. Finally, the potential of using these digitized images for image-fusion studies is verified with the test and evaluation results.

KEYWORDS: Night Vision Device, NVD, Image Intensification, II, Thermal Imaging, TI, Contrast Transfer Function, CTF, Modulation Transfer Function, MTF, Image Fusion

COMBAT-SYSTEMS TECHNOLOGY

CHARACTERIZATION OF THREE-TO-FIVE MICRON THERMAL IMAGERS AND ANALYSIS OF NARROWBAND IMAGES

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In this study, the use of multiple narrowband filters is explored to correlate or fuse information to improve detection and recognition for specific targets of interest. To fully understand the viability and limitations of narrowband filters in thermal imaging, laboratory test procedures are first designed to characterize thermal images using common performance parameters, particularly the noise-equivalent temperature difference (NETD), the modulation-transfer function (MTF) and the minimum resolvable temperature (MRT). An available thermal imager, the Cincinnati Electronics IRRIS-256LN, and a newly purchased thermal imager, the Indigo Systems Merlin InSb Laboratory Camera, are investigated and compared. The MRT measurement shows a superior cut-off spatial frequency of 1.33 cycle/mrad for the Merlin camera, compared with 1.18 cycle/mrad for the Cincinnati, with similar sensitivity of about 0.1 °C for both cameras. Below cut-off, the MTF for the Merlin is approximately twice that of the Cincinnati. NETD measurements for both systems are inhibited by excess noise in the measurement system. The Merlin camera is consequently employed for further research on narrowband images. Three commercially available narrowband filters, 4110/4720 nm, 4540/4720 nm and 3750/4020 nm, are selected to isolate the red- and blue-spike signatures of plume emission and aerodynamic heating found in the signature of fast-moving air targets. Similar sensor characterization is carried out with these filters; however, quantitative performance parameter measurements are hindered by excessive measurement system noise. As a preliminary study in multi-spectral image analysis, spectral features of hydrocarbon combustion are extracted from correlated narrowband images of a laboratory propane flame. Digital analysis using software statistical tools shows potential for discrimination of hydrocarbon emission from other thermal sources by correlating pixel number and pixel radiant intensity.

KEYWORDS: Thermal Imager, Narrowband Images, Narrowband Filter, Minimum Resolvable Temperature, Noise Equivalent Temperature Difference, Modulation Transfer Function

SURVIVABILITY ENHANCEMENT IN A COMBAT ENVIRONMENT

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The objective of this thesis is to provide a given aircraft with an optimal route to its destination that avoids encroaching into surface-to-air weapons' killing envelopes in real time. The optimal route computed is updated dynamically, depending on the location of the vehicle and the location of the surface-to-air missile (SAM) sites. The problem is solved using heuristic algorithms instead of the conventional Dijkstra and Bellman Ford algorithms, which are computationally expensive. Data-fusion techniques such as bearings triangulation, spatial-correlation, and ellipses-combination algorithms are presented in detail. Such techniques are important for situational awareness in a real-time combat environment. Important information provided by onboard sensors is merged with the preplanned data to provide the operator with a better-integrated picture of the combat environment.

KEYWORDS: Kill Envelopes of Surface-to-Air Missile Sites, Circular Error Probable, CEP, Uncertainty Ellipse, Correlation, Bearings Triangulation, Optimal Route, Route Planning, Data Fusion

RADAR POLARIMETRY

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Radar polarimetry is a recent development actively researched only in the last few decades. The phenomenon that optimal (maximal-power) reflected fields exist in both the co-polarized and cross-polarized channels of the receiving radar antenna was first introduced by Kennaugh and Huynen. Current research efforts focus on target-scattering matrices, relating them to physical attributes of the target. This thesis provides a comprehensive survey of the polarimetry theories put forth by various researchers to characterize, manipulate, and optimize target-radar returns via polarization states. One such theory is the target-decomposition (TD) theorem that seeks to decompose the target returns into individual scattering mechanisms. The topic of optimization of polarization-states of the incident field for maximizing power return is also examined. Two models are implemented in MATLAB to verify and demonstrate these polarimetry theories. The first model uses TD theorems to simulate foliage clutter and study its effect on the polarization of the incident electric field. A (simulated) static dihedral target is introduced and its effect on wave polarization is also simulated. The second model studies optimization of polarization states. Both models are able to produce the expected results for known canonical targets.

KEYWORDS: Radar, Polarimetry, Polarization, Target Decomposition Theorem, Jones Vector, Stokes, Mueller, Pauli Matrices, Polarization States Optimization

MASTER OF SCIENCE IN COMPUTER SCIENCE

BUILDING SOFTWARE TOOLS FOR COMBAT MODELING AND ANALYSIS

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The focus of this thesis is to use and leverage the strengths of methodologies for dynamic computer-program-analysis in software-engineering testing and debugging, such as program-behavior modeling and event grammars, to automate the building and analysis of combat simulations. An original high-level language, Meta-Language for Combat Simulations (METALS), and its associated parser and C++ code generator, are designed to reduce the amount of time and developmental efforts needed to build sophisticated real-world combat simulations. A C++ simulation of the Navy's current mine-avoidance problem in littoral waters is generated using high-level METALS description in the thesis as a demonstration. The software tools developed allow users to focus their attention and efforts in the problem domain while sparing them, to a considerable extent, the rigors of detailed implementation.

KEYWORDS: Event Grammar, Context Free Grammar, BNF, Rigal, Lexical Analyzer, Language Parser, Code Generator, Mine Avoidance Concept, METALS, Latvia

USE OF OPENSSSH SUPPORT FOR REMOTE LOGIN TO A MULTILEVEL SECURE SYSTEM

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Complex multilevel secure (MLS) architectures are emerging that require user identification and authentication services not only from multilevel connections, but from pre-existing single level networks. The XTS-400 can be used as a server in such environments. Trusted devices are required for user login via multilevel connections; however, single level remote login facilities do not require such client-side devices. Instead, a more lightweight mechanism is possible.

Remote login capabilities do not exist on the XTS-400 for use over the single level networks and this capability is a desired feature for use in complex multilevel architectures. OpenSSH is an application, developed for OpenBSD, that uses the SSH protocol to provide secure remote logins and an interactive command interface. A secure remote login application, OpenSSH, is ported to the XTS-400 in order to provide remote login capabilities.

The porting process identifies differences between the original development platform for OpenSSH and the XTS-400. Solutions, in the form of source code modifications, are made to overcome problems resulting from the compatibility differences encountered during the port. Testing is conducted to ensure that the port is successful and does not violate any security policies enforced by the XTS-400.

KEYWORDS: OpenSSH, XTS-400, Remote Login

SIMULATION MODELING AND ANALYSIS OF DEVICE-AWARE NETWORK ARCHITECTURES

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As the popularity of the Internet soars, the content on the Internet is increasingly accessed by mobile devices that are usually small in form factor and limited in resources in terms of processing capability, bandwidth, and battery power. With the changing environment, content providers must serve a large number of access devices with different profiles, while users have access to a large number of services with different content types. A key challenge in such an environment is how to enable the best possible fit between content and capabilities of a specific access device type.

The goal of this thesis research is to explore the concept of a device-aware network (DAN) that can provide the infrastructure support for device-content compatibility matching to avoid the unnecessary wasting of network and device resources that occurs in current device-ignorant networks. A more efficient architecture is proposed which encapsulates device profile information in transmitting packets and incorporates content repurposing functionality in existing network entities, such as routers along the data path. Simulation models are developed to statistically evaluate the performance of the proposed architecture in comparison to existing content repurposing frameworks. The results demonstrate the feasibility and suitability of the architecture, with improvement in network bandwidth conservation.

KEYWORDS: Communications, Device-Aware Network, Content Repurposing, Device Profiling, Simulation, OPNET, OMNeT++

SIMULATION AND PERFORMANCE EVALUATION OF ROUTING PROTOCOLS FOR MOBILE AD HOC NETWORKS

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This thesis presents a simulation and performance evaluation analysis of the various routing protocols proposed for the mobile ad hoc network (MANET) environment using the Network Simulator-2 (NS-2) tool. Many routing protocols have been proposed by the academic communities for possible practical implementation of a MANET in military, governmental, and commercial environments. Four such routing protocols are chosen for analysis and evaluation: ad hoc on-demand distance vector routing (AODV), dynamic source routing (DSR), destination-sequenced distance vector routing (DSDV) and optimized link state routing (OLSR). NS-2 is developed and maintained by the University of Southern California's Information Sciences Institute (ISI). Leveraging on NS-2's simulation capabilities, the key performance indicators of the routing protocols, such as data network throughput, routing overhead generation, data delivery delay, and energy efficiency or optimization, are analyzed. The last metric is explored, especially due to its relevance to the mobile environment. Energy is a scarce commodity in a mobile ad hoc environment. Any routing software that minimizes energy usage prolongs the livelihood of the devices used in the battlefield. Three important mobility models are considered: random waypoint, Manhattan grid and reference-point group mobility. The application of these three models enhances the realism of simulation to actual real-life mobility in an urban or military setup scenario.

The performance of the routing protocols in varied node density, mobility speed, and loading conditions is studied. The results of the simulation provide invaluable insights to the performance of the selected routing protocols. This can serve as a deciding factor for the DoD in their selection of the most suitable routing protocols tailored to their specific needs.

KEYWORDS: Mobile Ad Hoc Network, Mobility, Routing Protocols, Network

UTILIZING IXP1200 HARDWARE AND SOFTWARE FOR PACKET FILTERING

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This thesis represents a first step towards research in IXP1200 packet filtering by providing a stable system that can provide a reliable platform for further research. Introduced are the fundamental hardware of Intel's IXP1200 and the requirements for installation of both hardware and software using Windows 2000 and Linux 7.2 as the operating system in support for the IXP1200.

This thesis provides information on the installation of hardware and software configuration for the IXP1200, including Intel's software-development kit. Upon completion, this platform is able to conduct further research in the development of the IXP1200 network processor. This thesis provides a hardware and software installation checklist and documentation of problems encountered, along with recommendations for resolution. Included is an example using preexisting code that has been modified to filter packets of TCP or UDP to different ports.

KEYWORDS: IXP1200, Data Compression, Software Development Kit, Packets Filter

CONTENT REPURPOSING OF ELECTRICAL DIAGRAMS FOR PRESENTATION IN HANDHELD DEVICES

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This thesis proposes a design for content repurposing of electrical diagrams for presentation in small-screen wireless handheld devices. Content repurposing is the on-line adaptation of content to fit device capabilities and user preferences. The focus of this thesis is the electrical diagrams of the schematic type used for maintenance purposes, though many of the proposed techniques are suitable for other technical drawings as well. A significant amount of work exists summarizing Web documents and diagram recognition, but not for presentation of diagrams in handheld devices. In the suggested design, techniques are proposed for understanding the semantics of electrical diagrams and for partitioning the drawing images in intelligent ways to formulate coherent units for presentation to the user.

KEYWORDS: Content Repurposing, Artificial Intelligence, Electrical Diagrams, Image Analysis, Vector Graphics, Handheld Devices, Wireless Networks, Composite Capabilities/Preferences Profile, CC/PP

SECURE DISTRIBUTION OF OPEN-SOURCE INFORMATION

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In this thesis, a cryptographic protocol for delivering open-source information is developed. The protocol will be used as the distribution mechanism for all open-source deliverables associated with the Trusted Computing Exemplar project. Formal methods and techniques are applied to the entire development process. A background on using formal methods for the development of cryptographic protocols is provided, along with a description of the advantages and disadvantages of certain approaches. The strand space method developed at MITRE is used as the formal framework for modeling requirements, specifying the protocol design and verifying the design.

KEYWORDS: Formal Methods, Cryptographic Protocols, Protocol Analysis, Trusted Computing Exemplar, Requirements Modeling

AN ARCHITECTURE FOR NETWORK-CENTRIC OPERATIONS IN UNCONVENTIONAL CRISES: LESSONS LEARNED FROM SINGAPORE'S SARS EXPERIENCE

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Singapore and many parts of Asia were hit with Severe Acute Respiratory Syndrome (SARS) in March 2003. The spread of SARS led to a rapidly deteriorating and chaotic situation. Because SARS was a new infection, there was no prior knowledge that could be referenced to tackle such a complex, unknown, and rapidly changing problem. Fortunately, through sound measures coupled with good leadership, quick action, and inter-agency cooperation, the situation was quickly brought under control.

This thesis uses the SARS incident as a case study to identify a set of network-centric warfare methodologies and technologies that can be leveraged to facilitate the understanding and management of complex and rapidly changing situations. The same set of methodologies and technologies can also be selectively reused and extended to handle other situations in asymmetric and unconventional warfare.

KEYWORDS: Network-Centric Warfare, Technical Architecture, Mobile Computing, Collaborative Networks, Social Networks, Networks, Data Interoperability, Middleware, Ad Hoc Processes, Ad Hoc Teams

DISTRIBUTED DEPLOYMENT OF THERMINATORS IN THE NETWORK

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The idea of deploying a distributed-network intrusion system using Therminator, an advanced information-security tool, is explored in this thesis. There are many advantages in having a distributed system compared to a standalone-network intrusion system. The underlying principle of Therminator is modeling network traffic on conversation exchange models. Using Zippo, a new implementation of Therminator, the experimental setup consists of multiple sensors reporting individual findings to a central server for aggregated analysis. Different scenarios of network attacks and intrusions are planned to investigate the effectiveness of the distributed system. The network attacks are taken from the M.I.T Lincoln Lab 1999 data sets. The distributed system is subjected to different combinations of network attacks in various parts of the network. The results are then analyzed to understand the behavior of the distributed system in response to the different attacks. In general, the distributed system detects all attacks under each scenario. Some surprising observations also indicate attack responses occurring in unanticipated scenarios. These results are subject to further investigation.

KEYWORDS: Distributed, Network Intrusion System, Therminator, Zippo, Lincoln Lab Data

WIRELESS-NETWORK SECURITY: DESIGN CONSIDERATIONS FOR AN ENTERPRISE NETWORK

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Since its introduction in 1999, the Institute of Electrical and Electronics Engineers (IEEE)'s 802.11 wireless local-area network (WLAN) has become the de-facto standard for wireless networking, providing convenient and low-cost connectivity. Increasingly, enterprises are extending their networks with 802.11-based WLANs to provide mobility and information-on-the-move for employees. However, the introduction of WLANs into enterprise networks raises major concerns about security. A poorly implemented WLAN introduces weaknesses in the enterprise network that can be exploited by attackers, resulting in severe consequences for the enterprise.

This thesis is sponsored by the Department of Defense (DoD) to study the problem of designing a secure wireless architecture for an enterprise network. The specific requirements for the enterprise network are based extensively on the DoD and the intelligence community's security guidelines and policies. This thesis provides an in-depth analysis into the 802.11 standard and measures how far the standard goes in meeting the specific requirements of the enterprise network. This thesis presents a layered-defense architecture to provide a scalable design for secure wireless networks. A prototype system utilizing XML to control the flow of classified information in wireless networks is also presented.

KEYWORDS: 802.11, WLAN, 802.11i, WEP, WPA, WIRELESS

MASTER OF SCIENCE IN CONTRACT MANAGEMENT

THE PERFORMANCE OF LOGCAP IN OPERATIONS ENDURING- AND IRAQI FREEDOM

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The purpose of this study is to examine the role of the LOGCAP logistics-support unit (LSU) in Southwest Asia during the early stages of Operations Enduring Freedom and Iraqi Freedom. The study provides a summary of the LSU makeup and its roles, training, and processes and procedures. The study also analyzes the impact of the training and processes and procedures on the mission of the LSU and changes that were made during deployment. Evidence is provided to demonstrate the difficulties the LSU encountered as a result of role confusion and inadequate training. The empirical data presented show a correlation between role confusion and inadequate training as the cause of extended timelines and numerous changes in attempts to meet military needs. The research outlines attempted improvements, as well as the results of their implementation. The study provides conclusions based upon the analysis and presents three recommendations for improving the LSU to ensure that the next deployment to a large-scale contingency leverages the lessons learned from this experience. The basis of this study is provided by review and analysis of empirical data gathered from December 2002 through May 2003, interviews with LSU members and General Accounting Office (GAO) audit reports.

KEYWORDS: LOGCAP, Logistics, Training, Operation Enduring Freedom, Operation Iraqi Freedom, LSU, Support Unit, Southwest Asia

THE EFFECTS OF DEPARTMENT OF DEFENSE ACQUISITION REFORM ON WOMEN- OWNED SMALL BUSINESSES AND SMALL, DISADVANTAGED BUSINESSES

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This study examines the effects of acquisition reform on women-owned small businesses (WOSBs) and small, disadvantaged businesses (SDBs) who contracted with the Department of Defense (DoD) during the 1990s through 2002. Review and analysis of DoD data for fiscal years 1992 through 2002, an analysis of websites and acquisition literature, and interviews with DoD contracting and small-business specialists provide the basis for this study. This study identifies acquisition-reform legislation enacted in the 1990s that has directly impacted WOSBs and SDBs and examines the charge that the practice of contract bundling has negatively impacted the ability of small businesses to win DoD contracts. An analysis of contract bundling data from the Small Business Office of Advocacy, Congress, and DoD demonstrates that the data is insufficient and inconsistent to prove or disprove that contract bundling is negatively impacting small businesses. However, DoD data for fiscal years 1992 through 2002 indicates that DoD contracting with WOSBs improved consistently, particularly after enactment of the Federal Acquisition Streamlining Act of 1994, which mandated that the federal government, inclusive of DoD, award five percent of total yearly procurement dollars to WOSBs.

KEYWORDS: Acquisition Reform, Women-owned Small Businesses, Small Disadvantaged Businesses, Procurement, Contracting Officer, Small Business Specialist

MASTER OF SCIENCE IN DEFENSE ANALYSIS

APPLYING BAYESIAN BELIEF NETWORKS IN SUN TZU'S *ART OF WAR*

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The principles of Sun Tzu's *Art of War* have been widely used by business executives and military officers with much success in the realm of competition and conflict. However, when conflicts arise in a highly stressful environment, coupled with the pressure of time, decision makers may not be able to consider all the key concepts when forming their decisions or strategies. Therefore, a structured reasoning approach may be used to apply Sun Tzu's principles correctly and fully. Sun Tzu's principles are believed capable of mathematical modeling; hence, a Bayesian network model (a form of mathematical tool using probability theory) is used to capture Sun Tzu's principles and provide a structured-reasoning approach. Scholars have identified incompleteness in Sun Tzu's appreciation of information in war and his application of secret agents. This incompleteness results in circular reasoning when both sides of the conflict apply his principles, which is resolved through the use of advanced probability theory. A Bayesian network model not only provides a structured-reasoning approach, but more importantly, it can also resolve the circular-reasoning problem identified.

KEYWORDS: Sun Tzu, *Art of War*, Causality, Causal Map, Bayesian Network, Bayesian Belief Network, Circular Reasoning

THE ROLE OF CULTURAL UNDERSTANDING AND LANGUAGE TRAINING IN UNCONVENTIONAL WARFARE

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Second Reader: Anna Simons, Department of Defense Analysis

The level of violence has increased constantly over the last decades and has also shifted in nature from conventional to unconventional. Given these circumstances, Romania's national interests call for the development of unconventional capabilities needed to deal with current and future low-intensity conflicts.

This thesis analyzes the influence of language training and cultural understanding on the overall success of counterinsurgency campaigns. Examining some situations where U.S. and British forces carried out counter-insurgency operations, this project reveals that ground troops with foreign-language skills and cultural training were able to work more efficiently with the local population. Cultural awareness facilitated communication and developed interpersonal trust. Additionally, language and cultural training enhanced military personnel's ability to understand the operational environment and to make more selective use of force.

The purpose of this thesis is not to promote a departure from conventional military training, but rather to propose the development of new Romanian military capabilities, the performance of which will increase through better exploitation of language and cultural resources.

KEYWORDS: Unconventional Warfare, Insurgency, Counter-insurgency, Indian War, Oman, South Yemen, Philippine, Dhofar Insurgency, Jabal Akhdar Insurgency, Aden Insurgency, Radfan Insurgency, Language and Cultural Training

DEFENSE ANALYSIS

AN ANALYSIS OF UNITED STATES–ALBANIAN SECURITY RELATIONS IN LIGHT OF THE WAR ON TERRORISM

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This thesis explores U.S.–Albanian relations, focusing on security cooperation. Since its inception as an independent state, Albania's relations with the United States have been the focus of Albanian foreign policy. After the First World War, Albania survived as an independent state largely due to the support of the United States. Albanian–U.S. relations have had ups and downs, with the most unfortunate period being the post-World War Two timeframe, when relations were severed and Albania was put under communist domination for half a century. After the collapse of communism, a revitalization of U.S.–Albanian relations took place. Albania is becoming an increasingly important ally for the United States in the Balkans. The security partnership between the two countries reached its zenith during the Kosovo crisis and was further fostered after September 11, 2001, as Albania unequivocally offered to cooperate with the United States in the War on Terrorism. September 11 changed the way the partner countries' capabilities are viewed by the United States. Albania, a perceived Muslim majority country, may prove in the future to be more important to the U.S. through its contribution to the war on terrorism than through its military capabilities.

KEYWORDS: Security Relations, War on Terrorism, Regional Stability, Defense Cooperation, Integration

AN ALTERNATIVE MILITARY STRATEGY FOR THE WAR ON TERROR

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Alternative military strategy for the War on Terrorism calls for addressing the war as a global insurgency; addressing the War on Terrorism as a global insurgency provides an alternative strategic framework for prosecuting the campaign. This study is intended to determine the utility of analyzing the War on Terrorism using an insurgency/counterinsurgency conceptual framework. Recommendations made in this thesis can be applied to the strategic campaign, even if it is politically unfeasible to address the war as an insurgency.

The first half of the study provides a thorough understanding of McCormick's counterinsurgency (COIN) model. This is done by, first, providing an overview of the model and, second, applying the model to a historical case. The second half of the study addresses the war on terror. The COIN model is applied to the War on Terrorism based on the al Qaeda network and the United States' vision and mission for the conflict. Conclusions from the analysis are broken down into ten recommendations for the U.S. strategic framework for approaching the war. The final chapter addresses the utility provided by the insurgency/counterinsurgency framework as applied to the war on terror.

KEYWORDS: War on Terrorism, Global Insurgency, Insurgency, Counterinsurgency, COIN, Hizballah, Lebanon, al Qaeda, al Qaeda Network, AQN, Military Strategy, U.S. Strategy, WOT, GWOT

DEFENSE ANALYSIS

UNDER NEW MANAGEMENT: WILL AMERICA'S DEDICATED COMBAT-SEARCH-AND-RESCUE FORCES FINALLY THRIVE IN AIR FORCE SPECIAL-OPERATIONS COMMAND?

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On 1 October 2003, the U.S. Air Force (USAF) transferred control of its continental U.S. (CONUS)-based combat-search-and-rescue (CSAR) assets from Air Combat Command to Air Force Special Operations Command (AFSOC). Transfer to AFSOC was CSAR's fourth major reorganization in twenty years, and was the latest in a turbulent procession of attempts to improve the combat effectiveness of CSAR forces. Despite possessing an abundance of brave, motivated, and extremely capable personnel yearning to accomplish their mission, dysfunctional organizational arrays and nagging organizational constraints prevented USAF-dedicated CSAR forces from "getting to the fight" for the onset of hostilities in three of this nation's four major armed conflicts. Special operations forces had to fill the void. This analysis evaluates CSAR's position within AFSOC's organizational array to determine if this latest reorganization is likely to produce durable improvements in CSAR combat effectiveness. This thesis concludes that a "CSAR-friendly" organizational culture and effective organizational constructs within AFSOC headquarters, combined with highly receptive attitudes among CSAR crewmembers, form a historically unique organizational mix that favors the long-term success of CSAR forces in AFSOC. To ensure that AFSOC's favorable organizational posture is translated to improved combat capability, leadership must immediately increase CSAR representation on higher headquarters staffs.

KEYWORDS: Combat Search and Rescue, CSAR, Special Operations Forces, SOF, Organizational Theory, Air Force Special Operations Command, AFSOC

ROMANIAN SPECIAL FORCES: IDENTIFYING APPROPRIATE MISSIONS AND ORGANIZATIONAL STRUCTURE

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Trying to adapt to the post-9/11 challenges to Euro-Atlantic security, the Romanian Ministry of National Defense continues its efforts to modernize and professionalize the country's armed forces in accordance with NATO standards. Part of this process is the development of a Special Forces (SF) capability scheduled for initial operational readiness by fiscal year 2005. With appropriate organizational arrangements and focused combat training, the Romanian SF will increase their performance during future deployments in joint and combined settings.

This project analyzes Romania's strategic documents, identifies the missions that can be conducted by the country's general-purpose forces or other security services, and finally proposes five appropriate tasks for the SF: combating terrorism, counter-proliferation of weapons of mass destruction, special reconnaissance, direct action, and security detail for Romanian officials in crisis zones. In exploring the most effective structural arrangements for the Romanian Special Forces, this thesis uses a design program. Recommendations of this design program lead to the proposal of a new organizational structure. It is determined that Romania's Special Forces elements should develop into a flexible, highly-mobile and joint organization displaying a flat hierarchy and centralized command and control.

KEYWORDS: Romanian Special Forces, Special Operations Forces Missions, Romanian National Security Strategy, Romanian Government Defense and Security White Paper, North Atlantic Treaty Organization, European Union, Organizational Design, Organizational Structure, Security Environment, Special Operations Organizational Configuration

DEFENSE ANALYSIS

DECISIONS INTEGRATION: A CRITICAL NECESSITY FOR SPECIAL OPERATIONS

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In a world in which the use of violence continues to be viewed as an acceptable method to pursue political goals, the use of terrorism as a political method will also continue. And within that world, in the coming years, hostage rescues and other direct actions to combat terrorism are likely to be the most frequent type of missions conducted by state special-operations forces, including those of Romania.

This thesis explores the importance of integrating three types of decisions—informational, structural and operational—for the successful outcome of special operations. The thesis analyzes four operations, conducted by American, Belgian, and Israeli forces, and the circumstances of their positive or negative outcomes. The historical cases show that, if any one of the three types of decisions was not integrated with the other two, the operation was doomed. The analysis also reveals that the integration of decision making can best be realized by using interagency coordination mechanisms and a collocation of decision makers, especially for situations in which command arrangements are highly complicated or unclear.

In light of the findings in the four case studies, an analysis of the Romanian special-operations forces reveals that its overall structure does not favor either immediate-response or high-complexity missions. The thesis concludes with a number of recommendations for short- and long-term mitigation of current command-and-control problems faced by Romanian special-operations forces.

KEYWORDS: Decision Theory, Informational Decision, Organizational/Structural Decision, Operational Decision, Operation DRAGON ROUGE/NOIR, Operation THUNDERBALL/JONATHAN, Operation EAGLE CLAW, Operation GOTHIC SERPENT, Hostage Rescue, Direct Action, Stanleyville, Entebbe, Teheran, Mogadishu

NAVAL SPECIAL WARFARE (NSW) ENLISTED-MANNING CONCERNS: KEY ELEMENTS FOR SUCCESSFUL GROWTH AND RETENTION OF ENLISTED PERSONNEL

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Master of Science in Defense Analysis (Irregular Warfare)-June 2005

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To satisfy the requirement for increased SEAL manning, the Naval Special Warfare (NSW) community must examine the current options available in order to influence NSW recruiting and retention variables. The objective of increasing the enlisted SEAL inventory should include realistic methods to alter each independent variable and therefore create a large cumulative change by combining small incremental changes over time.

This thesis observes that NSW must strive for better-qualified personnel for the initial basic underwater demolition/SEAL (BUD/S) pipeline training to raise the percentage of graduating candidates who become SEALs. This can be done through more active recruiting and marketing outside of the Navy, as well as through a more selective BUD/S candidate-screening process. This strategy would give NSW a look at prospective recruits while at the same time providing the recruits a preview of NSW to determine if they fit the type of work environment associated with the SEAL teams. The key idea is that quality BUD/S graduates come from quality BUD/S recruits. Proposals included in this thesis would incrementally increase the SEAL manning inventory. Another retention option is to prolong the average NSW enlisted SEAL's career through various means. Certain pays and benefits should be raised to help create an incentive for all categories of SEAL operators to remain in the NSW community. There are numerous incentive options being explored at the Special-Operations Command (SOCOM) and NSW level, but this

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thesis emphasizes specialty pays and retirement. Another variable that may need to be addressed is the current NSW deployment strategy. Although there are required political and alliance-building concerns even in time of war, there is valid rationale to reduce, or even eliminate, joint combined exercises from the current NSW global agenda. A changed deployment strategy may lead to better retention and other long-term benefits.

Increasing the enlisted SEAL inventory will take time to implement. However, NSW needs to make an early change to the existing force structure that is significant enough to carry out current wartime requirements and sustain them during peacetime in the future. Additionally, NSW needs consistent benefits and long-term monetary compensation to retain enlisted SEALs for the long run.

KEYWORDS: Naval Special Warfare, NSW, Enlisted Manning Concerns, Key Elements for Successful Growth, Retention, Enlisted Personnel

DEMOCRACY IN A POST-CASTRO CUBA?

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This thesis discusses key aspects of the democratization process in post-Castro Cuba following a destructive and chaotic transition of power. The theories of leading democracy and economic theorists are applied to the post-Castro conflict scenario as relevant issues to be addressed by a new Cuban government and the United States in a Cuban transition to democracy. Additionally, the ongoing U.S. efforts in Iraq provide a unique window of opportunity for further scrutiny of democratization theory as select lessons learned from the rebuilding of Iraq are compared to the future democratic transition of Cuba. While this thesis took this unique perspective in the democratic-transition environment, the resulting research and analysis support existing theories about the intertwining of political and economic development. The major distinction appears to be the need for greater flexibility in the process, post-conflict, due to the ambiguity involved. What needs to be fixed or rebuilt in Cuba will depend on the severity of damage to the political and economic infrastructure. The theorists selected are helpful in opening doors for what is relevant during the rebuilding and democratization process, but as expected, there is no definitive process for achieving democracy and a free-market economy.

KEYWORDS: Cuba, Democracy, Democratization Theory, Economics, Embargo, Governance, Iraq, Washington Consensus

CHINA'S DEVELOPMENT OF ASYMMETRIC WARFARE AND THE SECURITY OF TAIWAN, REPUBLIC OF CHINA

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Third Reader: George Lober, Department of Defense Analysis

This thesis examines the threat towards Taiwan posed by China's emergent asymmetrical warfare capability. The military changes that have transformed global politics in recent years, especially since the end of the Cold War, have brought about a revolution in military affairs (RMA) by the United States. The People's Liberation Army (PLA) began studying the RMA by focusing on asymmetric warfare capabilities under high-technological conditions. China believes that asymmetric operations have the advantages of enabling a swift and precise attack and avoiding mass destruction on Taiwan's infrastructure and high-tech industry. They also have the benefits of low intensity, low collateral damage, high efficiency, fast attack, and fast victory. In summary, asymmetric operations are regarded by the PLA as a kind of warfare that

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conforms both with the dictum of China's ancient war theorist Sun Tzu to "defeat the enemy without bloodshed and fighting" and with the demands of a modern economy.

In the face of China's development of asymmetric capabilities, Taiwan should think about how best to confront and counter China's threats and gain a military edge over China.

KEYWORDS: Taiwan, Republic of China, People's Republic of China, Asymmetric Warfare, Information Warfare, Revolution in Military Affairs, China's Military Modernization, Taiwan Strait Conflict

ARMED FORCES OF THE PHILIPPINES AND SPECIAL OPERATIONS

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In this thesis, the armed forces of the Philippines (AFP) and its special-operations capability are examined. The Philippines constitutes a unique security environment, with both internal and external challenges and concerns. Countering internal security threats, specifically insurgency, terrorism, and secessionists, remains the number one priority of the government and AFP. Common among these internal-threat groups is their strategy and tactics: unconventional and asymmetric.

This thesis seeks to determine how special operations can improve the AFP's capability to address internal-security threats. This study examines the current and emerging security environment in which the AFP will likely operate. The current special operations capability of the AFP is explored and assessed to determine whether enhancement is needed. Case studies of past major AFP special operations against internal threat groups are analyzed to determine if the doctrine and strategy of the AFP, in terms of the utilization of special-operations forces (SOF), have been correct. Furthermore, the study considers the United States' model for special operations, the U.S. Special Operations Forces, to propose a feasible, suitable, and sustainable special-operations capability for the AFP, with the goal of increasing its relevance, adaptability, and responsiveness vis-à-vis the internal-security requirements of the Philippine government.

KEYWORDS: Special Operations, Unconventional Warfare, Asymmetric Warfare, Guerrilla Warfare, Special Operations Forces, Insurgency, New People's Army, Abu Sayyaf Group, Hukbalahap, Moro Islamic Liberation Front, Armed Force of the Philippines

A PROPOSAL TO ADDRESS THE EMERGING MUSLIM-SEPARATIST PROBLEM IN THAILAND

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On January 4, 2004, four Thai soldiers were killed when approximately thirty armed bandits stormed the army depot in Narathiwat, 750 miles south of Bangkok, stealing a cache of 300 weapons. At the same time, eighteen schools in the area were set on fire in an effort to distract government officials from the attack. Based on credible information, the royal Thai government blamed Muslim separatists for the attacks. Previously, in the mid 1980s, the Muslim-separatist problem was eliminated in southern Thailand when the government took a two-fold approach: first, empowering the military to oversee both the police and civil-service sectors and later, based on recommendations from the military, initiating new social and economic policies. This thesis examines, through both a theory of counterinsurgency and an anthropological analysis of the conflict, the re-emergence of the Muslim-separatist groups. Short-term and long-term solutions for

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the royal Thai government are provided. This thesis offers background information about the historical relationship between the government and Thai Muslims in order to highlight why the former Muslim-separatist problem occurred in Thailand. Next, the Muslim-separatist problem is examined to determine why this problem is occurring again. Reasons for the Thai government's underestimation of the situation are also determined. This thesis addresses corrective measures the Thai government may take to preclude a future Muslim separatist insurgency, including an analysis of those measures that were successful in the past and a consideration of current conditions in Thailand that are conducive to an insurgency. Finally, short- and long-term conditions necessary for a successful resolution of the Muslim-separatist problem in Thailand are delineated.

KEYWORDS: Thailand, Insurgency, Muslim Separatist

MALAYSIAN EMERGENCIES: ANTHROPOLOGICAL FACTORS IN THE SUCCESS OF MALAYSIA'S COUNTERINSURGENCY

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In modern military thinking, a second, parallel military structure has emerged: counterinsurgency forces. Operating under various names, counterinsurgency troops try to overcome the lack of surgical precision of conventional forces. More importantly, such forces typically organize operations designed to drive a wedge between guerrillas and the population. The central problem of counterterrorism is how to pinpoint the enemy in order to destroy enemy forces and their capabilities. The present U.S. strategy for combating terrorism relies very much on the concept of the battle of ideas. But such efforts are likely to be far easier when the kind of anthropological factors that can strike deep at the heart of the people are considered. It is the contention of this thesis that counterinsurgency and counterterrorism efforts can be successful only if military strategy is blended with consideration of anthropological factors to win public support and earn the public's cooperation in devising a model appropriate for the local situation.

KEYWORDS: Counterinsurgency, Counter-terrorism, Guerrilla Warfare, Malayan Emergency, 2nd Malaysian Emergency, Anthropology, Vietnam War

MASTER OF SCIENCE IN ELECTRICAL ENGINEERING

SIMULATION OF WIRELESS PROPAGATION IN A HIGH-RISE BUILDING

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With the introduction of wireless local-area networks (WLANs) in many organizations, it became much easier to intercept confidential files and health records. This study focuses on radio frequency propagation in a high-rise building, specifically, the attenuation between floors and possibility of intercepting signals through floors. The work is based on simulations using the Urbana software tool. It predicts the contour of power levels of propagation for a given model using high-frequency ray tracing. The simulation indicates that signal levels for a 1 W transmitter could only be detected at the -70 dBm level within two floors (above or below). Even within this range, the signal distribution is very non-uniform, due to the effects of multipath. The results indicate that closing doors reduces signal levels, but only slightly for wooden doors. Signals escape the building through the window and travel between floors via this path. The ray tracing accounts for only single diffraction and therefore rays diffracted two or more times are not included.

KEYWORDS: Propagation, Indoor, Wireless, Urbana, Propagation Between Floors, Indoor Loss

A VIRTUAL ROBUST-SYMMETRICAL-NUMBER-SYSTEM (RSNS) DIRECTION-FINDING ANTENNA SYSTEM

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In this thesis, a performance analysis and improvement of a phase-sampling interferometer antenna system based on the robust-symmetrical-number system (RSNS) in the presence of noise is investigated. Previous works have shown that the RSNS-based direction-finding (DF) technique provides high bearing resolution with a minimum number of antenna elements. However, the previous experimental data showed significant deviation from the theoretical results expected due to imperfections, errors, and noise. Therefore, an additive Gaussian noise model of RSNS-based DF is established and simulated. Simulation results show that the presence of noise distorts the signal amplitudes used in the RSNS processor and causes degradation of the angle-of-arrival estimates. A performance analysis is undertaken by first introducing the quadrature modulation configuration into the RSNS-based DF system, which provides a digital antenna approach for more flexibility in the signal processing. With a digital approach, variable-resolution signal preprocessing is employed, using a *virtual-channel* concept. The virtual-channel concept changes moduli values without changing the actual physical antenna element spacing. This attractive property allows the RSNS algorithm to be implemented into existing antenna arrays and requires modifying the antenna signal processor only. Computer-simulation results show that the proposed method can successfully improve the system performance and also mitigate the effects of noise.

KEYWORDS: Robust Symmetrical Number System, Phase Sampling Interferometry, Direction Finding, Ambiguity Resolution, Additive Gaussian Noise, Variable Resolution, Virtual Channel

ELECTRICAL ENGINEERING

INFRARED-IMAGING FACE RECOGNITION USING NONLINEAR, KERNEL-BASED CLASSIFIERS

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In recent years, there has been increased interest in effective individual control and enhanced security measures, and face-recognition schemes play an important role in this increasing market. In the past, most face-recognition research studies were conducted with visible imaging data. Only recently have infrared (IR)-imaging face-recognition studies been reported for wide-use applications, as un-cooled IR imaging technology has improved to the point where the resolution of these much cheaper cameras closely approaches that of cooled counterparts. This study is part of an ongoing Naval Postgraduate School research project investigating the feasibility of applying a low-cost un-cooled IR camera for face recognition applications. This specific study investigates whether nonlinear, kernel-based classifiers may improve overall classification rates over those obtained with linear classification schemes. The study is applied to a 50-subject IR database developed in house with a low-resolution un-cooled IR camera. Results show best overall mean classification performances around 98.55%, which represents a 5% performance improvement over the best linear-classifier results obtained previously on the same database. This study also considers several metrics to evaluate the impact of variations in various user-specified parameters on the resulting classification performances. These results show that a low-cost, low-resolution IR camera combined with an efficient classifier can play an effective role in security-related applications.

KEYWORDS: Face Recognition, Pattern Classification, Infrared, GDA, Distances, Eigenvectors

A COMPARISON OF FREQUENCY-OFFSET-ESTIMATION METHODS IN ORTHOGONAL FREQUENCY-DIVISION MULTIPLEXING (OFDM) SYSTEMS

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Orthogonal frequency-division multiplexing (OFDM) is a modulation technique that achieves high data rates, increased bandwidth efficiency, and robustness in multipath environments. However, there are some disadvantages to OFDM, such as sensitivity to channel fading, large peak-to-average ratio and sensitivity to frequency offset. The latter causes inter-carrier interference (ICI) and a reduction in the amplitude of the desired sub-carrier, which results in loss of orthogonality. In this thesis, the effects of frequency offset are studied in terms of loss of orthogonality. A number of techniques for frequency-offset estimation are presented and tested in computer simulations.

KEYWORDS: OFDM, Frequency Offset, Frequency Offset Estimation, Inverse Fast Fourier Transform, Cyclic Prefix, Preamble

ELECTRICAL ENGINEERING

DIGITAL-PHASED-ARRAY ARCHITECTURES FOR RADAR AND COMMUNICATIONS BASED ON OFF-THE-SHELF WIRELESS TECHNOLOGIES

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This thesis is a continuation of the design and development of a three-dimensional 2.4 GHz digital-phased-array radar antenna. A commercial-off-the-shelf quadrature modulator and demodulator are used as phase shifters in the digital transmit and receive arrays. The phase response characteristic of the demodulator is measured and the results show that the phase difference between the received phase and transmit phase is small. In order to increase the bandwidth of the phased array, a method of time-varying phase weights for linear frequency modulated signal is investigated. Using time-varying phase weights on transmit and receive gives the best performance, but requires the range information of the target. It is more practical to use time-varying phase weights on only one side (transmit or receive, but not both) and constant phase weights on the other side. The simulation results show that by using time-varying phase weights, the matched filter loss is not as severe as when using the conventional fixed-weights technique. It is also found that this method is only effective for small scan angles when the time-bandwidth product is large. The approach to implement time-varying phase weights on transmit using commercial components, such as direct digital synthesizer and quadrature modulator, is discussed.

KEYWORDS: Phased Array, Radar, Antenna, Transmitter, Digital Receiver, Quadrature Demodulation, COTS

A LOW-COST, MAN-PORTABLE, FREE-SPACE-OPTICS COMMUNICATION DEVICE FOR ETHERNET APPLICATIONS

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This thesis seeks to design and implement a low-cost, portable, free-space optics (FSO) communications device for Ethernet applications. Under some circumstances, such a device would have utility at a combat-operations center, a field-artillery position, or wherever else fiber-optic cable is used in garrison or field. The design is based on commercial off-the-shelf components originally designed for fiber-optic applications. Based on a 100-megabits per second (Mbps) media converter, the design uses two fiber-optic transceivers coupled to collimating lenses to pass data over free space. Sustained data rate of 100 Mbps is achieved with full network functionality on an optical bench with a low-power (0.5 mW) laser diode transmitter without focusing optics on the receiver. The laser diode power (mounted on the transceiver) is measured with acceptable losses up to 300 feet during testing, using a photodiode with focusing optics. The findings indicate that a system with proper collecting optics could be optimized for free-space communication at short- to moderate ranges.

KEYWORDS: Free-space Optics, Laser Communications, Ethernet Media Conversion, Laser Modulation, Free-space Communicator, Man-portable Free-space Device

ELECTRICAL ENGINEERING

SIMULATION PERFORMANCE OF MULTIPLE-INPUT, MULTIPLE-OUTPUT SYSTEMS EMPLOYING SINGLE-CARRIER MODULATION AND ORTHOGONAL FREQUENCY-DIVISION MULTIPLEXING

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Master of Science in Electrical Engineering–December 2004

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This thesis investigates the simulation performance of multiple-input, multiple-output (MIMO) systems utilizing the Alamouti-based space-time block-coding (STBC) technique. The MIMO communication systems using the STBC technique employing both single-carrier modulation and orthogonal frequency-division multiplexing (OFDM) are simulated in MATLAB. The physical layer part of the IEEE 802.16a standard is used in constructing the simulated OFDM schemes. Stanford University interim (SUI) channel models are selected for the wireless channel in the simulation process. The performance results of the simulated MIMO systems are compared to those of conventional single-antenna systems.

KEYWORDS: Multiple-input Multiple-output, MIMO, Orthogonal Frequency Division Multiplexing, OFDM, Space-time Block Coding, STBC, Stanford University Interim Models, SUI Models, Spatially Correlated MIMO Channels, Spatial Diversity, Alamouti Scheme, Maximal Ratio Combining

SIMULATIONS OF DIVERSITY TECHNIQUES FOR URBAN UNMANNED-AERIAL-VEHICLE DATA LINKS

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Master of Science in Electrical Engineering–December 2004

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In urbanized terrain, radio-wave propagation is subjected to fading on large and small scales that impede the quality and reliability of data-link transmission. This has implications in many military applications. One example is the performance of unmanned-aerial-vehicle (UAV) data and communications links in complex urban environments.

The purpose of this research is to study the effectiveness of diversity techniques on the performance of urban UAV data and communications links. The techniques investigated are spatial, polarization, and angle diversities.

Ray-tracing software, Urbana Wireless Toolset, is used in the modeling-and-simulation process. The various combinations of diversity techniques are simulated using a realistic urban model. For the few transmit-receive geometries examined, it is found that angle diversity with a directive antenna provided the greatest increase in signal strength relative to the no-diversity case.

KEYWORDS: Unmanned Aerial Vehicles, Urban Radiowave Propagation, Spatial Diversity, Polarization Diversity, Angle Diversity, Urbana Wireless Toolset

MASTER OF SCIENCE IN ENGINEERING SCIENCE

DISTRIBUTED BEAMFORMING IN WIRELESS SENSOR NETWORKS

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Master of Science in Engineering Science (Electrical Engineering)–December 2004

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A wireless sensor network (WSN) consists of a large number of small sensor nodes that are densely deployed over an area to acquire information about targets of interest. These sensor nodes collaborate among themselves to form an ad hoc network and disseminate the collected target information to an unmanned aerial vehicle (UAV). The objective is to then increase the data rate and transmission range between the sensor nodes and the UAV. A distributed beamforming approach is proposed whereby the sensor nodes are grouped into clusters and their transmission is coordinated in order to form a distributed antenna array that directs a beam towards the UAV.

A simulation model is developed and implemented in the MATLAB programming language to study the effectiveness of beamforming using sensor clusters for establishing a communication link to the UAV. Results show that the antenna's main lobe remains relatively unchanged in the presence of position errors and sensor node failures or when the density of the sensor nodes changes. Additionally, the maximum average-power gain of the main lobe is increased by increasing the density of the sensor cluster, thereby increasing the transmission range between the sensor clusters and the UAV.

KEYWORDS: Wireless Sensor Networks, Distributed Beamforming, Random Arrays

MASTER OF SCIENCE IN INFORMATION-TECHNOLOGY MANAGEMENT

INTEGRATED NETWORK-APPLICATION MANAGEMENT (INAM)

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Master of Science in Information-Technology Management—December 2004

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This thesis attempts to create a desire for change in the Department of Defense (DoD)'s current approach to network-application management (NAM). The evolution of NAM into integrated network-application management (INAM) is a crucial component to network-centric warfare and achieving information superiority and interoperability. INAM is outlined as containing three functional requirements: network awareness, mission prioritization linkage to network resources, and the balancing of service management.

Scenarios play a key role in illustrating the new threats faced by the DoD today. These scenarios also identify limitations and challenges to NAM as it exists. These challenges require significant improvements in flexibility and responsiveness, while providing for wide integration.

Trends supporting change are identified in this thesis. Two of the more important are the rise of architectural and object-orient development. Examples such as training- and testing-enabled architecture (TENA), surveillance and target-acquisition network (STAN) experiments, and Virtual Proving Ground (VPG) are clear examples of this. The trend of merging the computer industry's efforts to expand the reach of operating systems with the traditional efforts from network management is also examined. Organizations such as Distributed Management Task Force (DMTF) are important to such examinations.

Successful change cannot be achieved without planning for transition. This thesis also presents some active transition efforts addressing network-centric warfare. TENA, VPG and the Naval Postgraduate School's Information-Technology Management master's program provide three examples of addressing transition in DoD.

KEYWORDS: INAM, Network Awareness, Mission Priorities, Network Services, JV2020, Information Superiority, Interoperability, NCW, Transition Management, OSI, SNMP, TMN, NOC, QoS, TCP, FORCEnet, A2C2, STAN, Enterprise Management, FEAF, FI2010, TENA, ATEC, DTC, VPG, MC02, JFCOM, JNTC, NMCI, PAMS, Neutral Zone

MASTER OF SCIENCE IN LEADERSHIP AND HUMAN-RESOURCE DEVELOPMENT

MENTAL-HEALTH SERVICES IN THE MARINE CORPS: AN EXPLORATORY STUDY OF STIGMA AND POTENTIAL BENEFITS OF DE-STIGMATIZATION TRAINING WITHIN THE OPERATIONAL-STRESS-CONTROL-AND-READINESS (OSCAR) PROGRAM

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Master of Science in Leadership and Human-Resource Development—December 2004

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This study examines stigma associated with mental-health-services counseling in the Marine Corps for the purpose of assessing areas of concern where lack of awareness or stigma exists. Marines with longstanding unresolved personal problems or more immediate emotional distress may be less effective and may not know where to go for help. Secondly, stigma may be associated with the fear of negative performance evaluations and decreased future promotions, which may reflect an underutilization of available mental-health services. Results of this study reflect that stigma does exist, Marines have a poor knowledge of the availability and variety of mental-health services, and there is little in the way of de-stigmatization training within the Marine Corps. By studying civilian models which may have a de-stigmatization component, this study presents possible methods for incorporating de-stigmatization training into the Operational-Stress-Control-and-Readiness (OSCAR) program. Theoretically, the results of this study, garnered through interviews with practitioners, literature, and an OSCAR-program review, can be used to further the efficacy of Marine Corps mental-health services through education and de-stigmatization training.

KEYWORDS: Stigma, Mental Health Services Stigma, Marine Corps, Military Stigma, OSCAR, Destigmatization Training

THE EFFECT OF THE UNITED STATES NAVAL ACADEMY FOUNDATION'S PREPARATORY PROGRAM ON THE ACADEMIC PERFORMANCE OF NAVAL ACADEMY MIDSHIPMEN

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This study examines the relationship between participation in the United States Naval Academy Foundation's preparatory school program and subsequent midshipman performance at the United States Naval Academy (USNA). A program review is conducted and several multivariate regression models are developed to analyze the effect of attending a Foundation prep school on the performance of Academy midshipmen. The data set consists of the USNA classes 1988-2002. The program evaluation assesses the curricula of each of the current Foundation prep schools and midshipman performance variables, and uses a decision matrix to rank each school. Multivariate regression is used to evaluate whether military prep schools or prep schools with a stronger academic curriculum are more likely to enhance midshipman performance at the Naval Academy. The results find few significant effects of attending a military prep school or prep school with stronger academic curriculum on midshipman performance; however, attending a four-year college does improve plebe CQPR and overall CQPR.

LEADERSHIP AND HUMAN-RESOURCE DEVELOPMENT

KEYWORDS: United States Naval Academy, USNA, United States Naval Academy Foundation, Preparatory Schools, Prep Schools, Midshipmen Performance, Military Academies, Service Academies

MASTER OF SCIENCE IN MANAGEMENT

AN EMPIRICAL EXAMINATION OF THE IMPACT OF JUNIOR-RESERVE-OFFICER- TRAINING-CORPS (JROTC) PARTICIPATION ON ENLISTMENT, RETENTION AND ATTRITION

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Master of Science in Management–December 2004**

**Advisors: Robert M. McNab, Defense Resources Management Institute
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The focus of this project is whether participation in the Junior Reserve Officer Training Corps (JROTC) influences youths' propensity to enlist; and for those who subsequently enlist, the influence on retention rates and the propensity to reenlist. The novelty of this thesis lies in conducting multivariate analysis of the impact of JROTC participation on enlistment, retention, and reenlistment. Data sources used include the 1980 High School and Beyond (HS&B) survey and the Defense Manpower Data Center (DMDC) enlisted personnel cohort files from fiscal years 1980 to 2000.

Researchers employ a number of econometric models with the HS&B data, including single equation PROBIT and LOGIT models, two-stage least squares (2SLS) with instrumental variables (IVs), and a bivariate PROBIT equation. Results show that JROTC participation positively influences enlistment when treated as exogenous for both high-school seniors and sophomores. The impact of JROTC participation on military-enlistment decisions becomes negligible however, when self-selection into the JROTC program of high-school students is taken into account.

Using PROBIT and LOGIT models on the DMDC data, researchers find that enlisted personnel who graduated from JROTC are more likely to reenlist than non-JROTC graduates. Using the Cox proportional-hazard-survival-analysis method, it is found that personnel who graduate from JROTC tend to stay longer and complete their first term more often than non-JROTC graduates.

Synthesizing the results, researchers conclude that policymakers might find it worthwhile to actively target JROTC cadets for enlistment because in the long run, it pays off in terms of higher first-term completion rates, which results in cost savings in the form of enlistment bonuses and training costs. One possible extension of this study is to monetize the results for a cost-benefit analysis of the JROTC program vis-à-vis other recruitment programs. Quantifying the net benefits and costs of the JROTC program will allow policymakers to make more informed decisions regarding the future of the JROTC program.

KEYWORDS: Multivariate Analysis, JROTC, Recruitment, Retention, Re-enlistment, Personnel Policy

AN EXTERNAL-STAKEHOLDER ANALYSIS OF A UNITED STATES ARMY DIRECTORATE OF CONTRACTING

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Master of Science in Management–December 2004

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The purpose of a United States Army's Directorate of Contracting (DOC) is to award or execute contracts for supplies or services and perform post-award contract-administration functions for the Army installation and units stationed at the installation. The DOC accomplishes its purpose within the context of the federal acquisition system's vision, which is to deliver, on a timely basis, the best-value product or service to the customer while maintaining the public's trust and fulfilling public-policy objectives. A DOC must consider many external stakeholders to achieve its purpose.

MANAGEMENT

The basic premise of this thesis research is to improve a DOC's organizational effectiveness through the examination of its external environment, particularly external stakeholders. The concept of stakeholder management concentrates on an organization's need to consider its relationships with specific stakeholder groups. An organization's ability to satisfy the desires of key stakeholders, meeting the stakeholders' criteria, is the key to an effective organization. Data are gathered from fifteen governmental stakeholders and fourteen contractors using a questionnaire that addresses such questions as, what are your organization's expectations and requirements of the DOC, how well did the DOC meet your needs and expectations, and does your organization control a resource needed by the DOC. The thesis summarizes findings and provides recommendations. The overall benefit of this thesis research is improved environmental awareness, which enables the DOC to become more effective in achieving its mission and meeting the desires of external stakeholders.

KEYWORDS: Organizational Effectiveness, External Environment of an Organization, Stakeholder Questionnaire, External Stakeholder Analysis, Stakeholder Management, Contracting, Directorate of Contracting

MASTER OF SCIENCE IN MECHANICAL ENGINEERING

AN EXPERIMENTAL STUDY OF STEADY-STATE, HIGH-HEAT FLUX REMOVAL USING SPRAY COOLING

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Master of Science in Mechanical Engineering—December 2004

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Spray cooling is a promising means of dissipating large steady-state heat fluxes in high-density power and electronic systems, such as thermo-photovoltaic systems. The present study reports on the effectiveness of spray cooling in removing heat fluxes as high as 220 W/cm^2 . An experiment is designed to determine how the parameters of spray volumetric flow rate and droplet size influence the heat-removal capacity of such a system. A series of commercially available nozzles are used to generate full-cone water-spray patterns encompassing a range of volumetric flow rates (3.79 to 42.32 L/h) and droplet Sauter mean diameters (17.4 to 35.5 micrometers). The non-flooded regime of spray cooling is studied, in which liquid spreading on the heater surface following droplet impact is the key phenomenon that determines the heat-transfer rate. The experimental data establishes a direct proportionality of the heat flux with spray-flow rate and an inverse dependence on the droplet diameter. A correlation of the data is developed to predict heat flux as a function of the studied parameters over the range of values tested in this experiment.

KEYWORDS: Spray Cooling, High Heat Flux Dissipation, Critical Heat Flux, Nucleate Boiling, Sauter Mean Diameter

MASTER OF SCIENCE IN METEOROLOGY

**AN ANALYSIS OF A DUST STORM IMPACTING OPERATION IRAQI FREEDOM,
25–27 MARCH 2003**

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Master of Science in Meteorology—December 2004

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Second Reader: Tom Murphree, Department of Meteorology

On day five of combat operations during Operation Iraqi Freedom, advances by coalition forces were nearly halted due to a dust storm initiated by the passage of a synoptically driven cold front. This storm impacted ground and air operations across the entire area of responsibility and delayed an impending ground attack on the Iraqi capital. Military meteorologists were able to assist military planners in mitigating at least some of the effects of this storm. This thesis examines the synoptic conditions leading to the severe dust storm, evaluates the numerical weather-prediction-model performance in predicting the event, and reviews metrics pertaining to the overall impacts on Operation Iraqi Freedom's combined air campaign. In general, the numerical model guidance correctly predicted the location and onset of the dust storms on 25 March 2003. As a result of this forecast guidance, mission planners were able to front load air-tasking orders with extra sorties prior to the onset of the dust storm and were able to make changes to planned weapons loads, favoring GPS-guided munitions.

KEYWORDS: Operation Iraqi Freedom, Southwest Asia, Iraq, Middle East, Case Study, Analysis, Dust Storm, Sand Storm, Shamal, Synoptic Cold Front, Extra-tropical Cyclone, Numerical Weather Prediction Models, NOGAPS, COAMPS, GFS

MASTER OF SCIENCE IN METEOROLOGY AND PHYSICAL OCEANOGRAPHY

ESTIMATION OF GEOACOUSTIC PROPERTIES IN THE SOUTH CHINA SEA SHELF USING A TOWED SOURCE AND VERTICAL-LINE HYDROPHONE ARRAY

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Master of Science in Meteorology and Physical Oceanography–December 2004

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Linear sound sweeps from a towed J15-3 sound source were collected at a moored VLA hydrophone array in the South China Sea during the ASIAEX experiment in May 2001. For research, measured signals were filtered and pulse compressed. The processed data showed a high signal-to-noise ratio.

In this thesis, given an *a priori* chirp sonar survey, a two-layer bottom “first guess” model is constructed. A broadband coupled-mode model is used to perform an exhaustive frequency variant sensitivity study of VLA pressures to changes in bottom properties as a basis for the geoacoustic inverse problem. Study results provide information on the observability of the various geoacoustic parameters and a procedure for the inversion. Matched field processing of the VLA data, using the same coupled-mode model, is then performed to calculate ambiguity diagrams from which geoacoustic parameter estimates are obtained. Since VLA pressure fields are not sensitive to changes in the sediment attenuation coefficient, a matched field technique that correlates the slope of modeled transmission loss to the negative slope of $10\log$ of the observed energy is performed in order to obtain estimates of the attenuation. These estimates show a frequency dependent attenuation coefficient in the 50-600 Hz frequency band.

KEYWORDS: Geoacoustic, Inversion, Matched Field, South China Sea, Sensitivity

AEROSOL-OPTICAL-DEPTH MODEL ASSESSMENT WITH HIGH-RESOLUTION, MULTIPLE-ANGLE SENSORS

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This thesis assesses the performance of the Naval Postgraduate School aerosol-optical-depth (NPS AOD) model utilizing very-high-spatial-resolution QuickBird (QB) satellite data. QuickBird-derived AOD results are compared to other satellite and ground-based AOD results: specifically, Aerosol Robotic Network (AERONET), Moderate-Resolution Imaging Spectroradiometer (MODIS), Multi-Angle Imaging Spectroradiometer (MISR) and Advanced Very-High-Resolution Radiometer (AVHRR). Data was collected around Sir Bu Nair Island, United Arab Emirates, in September 2004, as part of the UAE² Campaign. Satellite-measured radiances are calibrated and, due to spatial-resolution differences between sensors, modal radiances are calculated for areas matching the highest-resolution sensor. The AOD model is based on AVHRR wavelengths; hence, the modal satellite-measured radiances are linearly extrapolated to the

effective wavelengths of AVHRR. Results show application of the NPS AOD model to QuickBird data yields findings consistent with other satellite and ground-based retrievals. In general, the NPS AOD model works well for nadir and near-nadir view angles, but not for high-zenith angles.

KEYWORDS: Aerosol Optical Depth, AOD, MISR, MODIS, QuickBird, AERONET, AVHRR

MASTER OF SCIENCE IN MODELING, VIRTUAL ENVIRONMENTS, AND SIMULATION

UTILIZATION OF FORWARD ERROR-CORRECTION (FEC) TECHNIQUES WITH EXTENSIBLE MARKUP LANGUAGE (XML) SCHEMA-BASED BINARY-COMPRESSION (XSBC) TECHNOLOGY

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Master of Science in Modeling, Virtual Environments, and Simulation–December 2004

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Donald R. McGregor, Department of Computer Science

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In order to plug current open-sourced, open-standard Java programming technology into the building blocks of the U.S. Navy's ForceNet, stove-piped systems first need to be made extensible to other pertinent applications and then a new paradigm of adopting extensible and cross-platform open technologies will begin to bridge gaps with old and new weapons systems. A real time battle-space picture with as much or as little detail needed is now a current vital requirement. Access to this information via wireless laptop technology is available now. Transmission of data to increase the resolution of that battle-space snapshot will invariably be through noisy links. Noisy links such as those found in the shallow-water littoral regions of interest will be where autonomous underwater- and unmanned underwater vehicles (AUVs/UUVs) gather intelligence for the sea warrior in need of that intelligence.

The battle-space picture built from data transmitted within these noisy and unpredictable acoustic regions demands efficiency and reliability features abstract to the user. To realize this efficiency, Extensible Markup Language (XML) schema-based binary compression (XSBC), in combination with Vandermode-based forward error-correction (FEC) erasure codes, offers the qualities of efficient streaming of plain text XML documents in a highly compressed form, and a data self-healing capability should there be loss of data during transmission in unpredictable transmission mediums.

Both the XSBC and FEC libraries detailed in this thesis are open-sourced Java application-program interfaces (APIs) that can be readily adapted for extensible, cross-platform applications that will be enhanced by these desired features to add functional capability to ForceNet for the sea warrior to access on demand, at sea and in real-time. These features will be presented in the AUV Workbench (AUVW) Java-based application that will become a valuable tool for warriors involved with undersea warfare.

KEYWORDS: Autonomous Underwater Vehicle Workbench, AUVW, AUV, Erasure Codes, Extensible Markup Language, XML, Extensible Modeling and Simulation Framework, XMSF, Forward Error Correction, FEC, Scenario Authoring and Visualization for Advanced Graphical Environments, SAVAGE, XML Schema-based Binary Compression, XSBC

MASTER OF SCIENCE IN OPERATIONS RESEARCH

THE EFFECTIVE USE OF MULTIPLE UNMANNED AERIAL VEHICLES IN SURFACE SEARCH AND CONTROL

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This study analyzes the effective use of multiple unmanned aerial vehicles (UAVs) for the Navy's Surface Search and Control mission. In the future, the Navy hopes to leverage the capabilities of a family of UAVs to provide increased situational awareness in the maritime environment. This family of UAVs includes a broad-area maritime surveillance (BAMS) UAV and vertical take-off UAVs (VTUAVs). The concepts of operation for how these UAVs work together have yet to be determined. Questions exist about the best number of UAVs, types of UAVs and tactics that will provide increased capabilities. Through modeling and agent-based simulation, this study explores the validity of future UAV requirements and provides insights into the effectiveness of different UAV combinations. For the scenarios modeled, the best UAV combination is BAMS plus two or three VTUAVs. However, analysis shows that small numbers of VTUAVs can perform as well without BAMS as they do with BAMS. For combinations with multiple UAVs, BAMS proves to be a valuable asset that not only reduces the number of missed classifications, but greatly improves the amount of coverage on all contacts in the maritime environment. BAMS tactics have less effect than the mere presence of BAMS itself.

KEYWORDS: Unmanned Aerial Vehicles, UAVs, Agent-based Modeling, MANA, Surface Search and Control, Surface Surveillance Coordination, SSC, Broad Area Maritime Surveillance, BAMS, Vertical Take-off Unmanned Aerial Vehicle, VTUAV, Common Operational Picture

LITTORAL-COMBAT SHIP (LCS) MANPOWER-REQUIREMENTS ANALYSIS

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The littoral-combat ship (LCS's) minimally manned core-crew goal is 15 to 50 manpower requirements, while the threshold, for both core and mission-package crews, is 75 to 110. This dramatically smaller crew goal requires more than current technologies and lessons learned from reduced-manning initiatives. Its feasibility depends upon changes in policy and operations, leveraging of future technologies, and increased workload transfer from sea to shore, along with an increased acceptance of risk.

A manpower requirements analysis yielded a large baseline (~200) requirement to support a notional LCS configuration. Combining the common systems from the General Dynamics and Lockheed Martin designs with other assumed equipments (i.e. the combined diesel-and-gas turbine [CODAG] engineering plant) produce the notional LCS configuration used as the manpower-requirements basis. The baseline requirement is reduced through the compounded effect of manpower savings from Smart Ship and OME and suggested paradigm shifts. A battle bill is then created to support the notional LCS during conditions of readiness I and III.

OPERATIONS RESEARCH

An efficient force-deployment regime is adopted to reduce the overall LCS-class manpower requirement. The efficiency gained enables the LCS force to “flex” and satisfy deployment requirements with 25% to 30% fewer manpower requirements over the “one-for-one” crewing concept, with an annual manpower savings of \$80M to \$110M if each requirement costs \$60K.

KEYWORDS: Crewing, Human Capital, Littoral Combat Ship, LCS, Manning, Manpower, Minimal Manning, Optimization, Optimal, Manpower, Requirements, Composite Sailor, Technology Leverage, Workload Transfer

SEQUENTIAL MULTIPLE-COMPARISON TESTING FOR BUDGET-LIMITED APPLICATIONS

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Computer simulations that forecast the performance of complicated systems are used as decision aids in many applications. For example, a ship’s defensive system may use simulation to support an automated real-time response to a perceived threat, such as an incoming missile. The system uses cumulative simulation data to evaluate a set of options in order to choose the best countermeasure. Since everything happens in “real time,” the system has limited time to run the simulation.

Normally, a system runs the simulation an equal number of times for each option before coming to a decision. But this may cause the system to waste time on options which can be deemed non-optimal after only a few simulation runs. This time is better used to help adjudicate between the better options.

This thesis examines research evaluating the performance of sequential multiple-comparison algorithms to eliminate inferior options as quickly as possible, to have more time to dedicate to the exploration of better options so that better decisions may be made. These algorithms allow inferior options to be dropped quickly, depending on how well separated they are from others, but the algorithms differ in how well they achieve this objective.

KEYWORDS: Simulation, Sequential Analysis, Multiple Comparisons

RADAR SEARCH AND DETECTION WITH THE CASA 212 S43 AIRCRAFT

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This research develops a detection-rate model to analyze the effectiveness of the RDR 1500B search radar installed in the CASA 212 S43 aircraft belonging to Venezuelan naval aviation. The model is based on a search-and-detection mission to find a diesel submarine executing an incursion inside the Venezuelan Caribbean Sea area, assumed to be intermittently operating with periscopes or masts exposed above the sea surface. The analysis obtains cumulative probability of detection versus time, based on the radar manufacturer’s performance data, user inputs for aircraft search-area size, search speed and search altitude, and submarine periscope or mast-exposure profile. The model can use given periscope-radar cross-section data or roughly calculate radar cross section given assumptions about exposed periscope height above the sea surface and sea-state conditions. Submarine evasion due to radar counter-detection is also modeled.

KEYWORDS: RDR 1500B Search Radar, CASA 212 S43 Aircraft, Search and Detection, Submarine Periscope Exposure

OPERATIONS RESEARCH

A NEW FICTITIOUS-PLAY PROCEDURE FOR SOLVING BLOTTO GAME

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In this thesis, a new fictitious-play (FP) procedure is presented to solve two-person, zero-sum (TPZS) Blotto games. The FP-solution procedure solves TPZS games by assuming that the two players take turns selecting optimal responses to the opponent's strategy observed so far. It is known that FP converges to an optimal solution and may be the only realistic approach to solve large games. The algorithm uses dynamic programming (DP) to solve FP subproblems. Efficiency is obtained by limiting the growth of the DP state space.

Blotto games are frequently used to solve simple missile-defense problems. While it may be unlikely that the models presented in this paper can be used directly to solve realistic offense and defense problems, it is hoped that they will provide insight into the basic structure of optimal and near-optimal solutions to these important large games and provide a foundation for solution of more realistic and complex problems.

KEYWORDS: Fictitious Play, New FP Procedure, Two Person Zero Sum, Blotto Game, Dynamic Programming

CIRCADIAN RHYTHMS, FATIGUE, AND MANPOWER SCHEDULING

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The Benefield anechoic facility (BAF) at Edwards Air Force Base, California, is the largest anechoic military test facility in the world for developmental and operational electromagnetic equipment. Supervisors must often extend employees' work hours considerably in order to meet mission (i.e., test) timelines. Supervisors at the BAF do not currently have accurate means of identifying when an employee's work performance is at risk of decreasing due to sleep deprivation, unbalanced circadian rhythms, or fatigue. The focus of this research is to create a method for supervisors to effectively gauge the work-performance levels of employees placed at risk of sleep deprivation. Individual sleep data are collected for one week on eight volunteers at the BAF using assigned sleep-monitoring devices known as actigraphs. Extensive questionnaires are developed to determine volunteers' sleep patterns, demographics, and Sleep history. For analysis purposes, the Fatigue-Avoidance Scheduling Tool (FAST), based on the sleep, Activity, Fatigue and Task-effectiveness (SAFTE) model, is used to determine how the performance level of each volunteer differed based on the amount of sleep acquired. The results demonstrate that as the week progresses and the volunteers' sleep decreases, the effectiveness of their work performance correspondingly decreases to a level where the safety of the test and the volunteers are both at risk.

KEYWORDS: Shift Work, Fatigue, Sleep, Circadian Rhythms, FAST, SAFTE, Sleep Deprivation, Sleep Debt

OPERATIONS RESEARCH

USING AGENT-BASED MODELING TO ASSESS THE IMPACT OF MARTIAL LAW ON A REPRESENTATIVE IRAQI TOWN

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Master of Science in Operations Research–December 2004

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One of the main challenges in the modeling and simulation community today is the study of human behavioral aspects, which are not often key considerations in traditional combat-oriented attrition-based models.

In a martial-law scenario, military or peacekeeping forces may be put in place to restore law and order and conduct a wide range of operations, such as setting up road blocks, imposing curfew, distributing food, and manning checkpoints. This thesis focuses on the checkpoint operation and uses the agent-based modeling software PAX to assess the impacts of such a scenario on the population.

Results indicate that civilians' levels of anger, fear, and need, and soldiers' rules of engagement play important roles in determining the success of peace-support operations.

KEYWORDS: Agent-based Simulation, PAX, Peace Support, Peacekeeping, Checkpoint, Human Behavioral Aspects

AN ANALYSIS OF FACTORS PREDICTING GRADUATION OF STUDENTS AT THE DEFENSE LANGUAGE INSTITUTE'S FOREIGN-LANGUAGE CENTER

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Second Reader: Lyn Whitaker, Department of Operations Research

This thesis analyzes factors related to academic, military, and personal backgrounds that affect graduation of students enrolled at the Defense Language Institute's Foreign Language Center (DLIFLC). The data in this thesis are taken from DLIFLC and only students from the four principal services with valid DLAB scores are considered for this study. Also, as DLI is concerned with students who do not make the grade academically, entries having administrative attritions are not considered. Four logistic regression models are analyzed for this study: graduation of students across all four categories of languages taught at DLIFLC, graduation of students in Category I languages, graduation of students in Category III languages and graduation of students in Category IV languages. The results of this study can assist DLIFLC in investing its resources in students with the best chance of success and identifying weaker students from the onset of a course.

KEYWORDS: Foreign Language Courses, Defense Language Institute Foreign Language Center, DLIFLC, DLAB Scores, Defense Language Institute, DLI, Category I Languages, Category III Languages, Category IV Languages

MASTER OF SCIENCE IN PHYSICAL OCEANOGRAPHY

WAVE REFRACTION OVER COMPLEX NEARSHORE BATHYMETRY

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Accurate predictions of nearshore wave conditions are critical to the success of military operations in the littoral environment. Although linear spectral-refraction theory is used by the main operational forecasting centers in the world for these predictions, its accuracy in regions of complex bathymetry, such as steep shoals and submarine canyons, is unknown, owing to a lack of field studies. This study examines the accuracy of linear spectral-refraction theory in areas of complex nearshore bathymetry with three months of extensive wave data collected during the Nearshore Canyon experiment (NCEX) held in the fall of 2003. The field site, off La Jolla, California, is characterized by two submarine canyons that strongly affect the propagation of long-period Pacific swell. Data from seven directional wave-rider buoys, seventeen bottom-pressure recorders and twelve pressure-velocity sensors are examined and compared to predictions made by a high-resolution spectral-refraction model. Analysis reveals large spatial variation in wave heights over the area, especially in the vicinity of the canyon heads, where wave heights vary by as much as an order of magnitude over a few hundred meters. This extreme variation in wave conditions across the canyons is surprisingly well described by refraction theory with typical errors of nearshore wave-height predictions of about twenty percent.

KEYWORDS: Refraction, Swell Transformation, Scripps Canyon, NCEX, Nearshore, Wave Model

MASTER OF SCIENCE IN PRODUCT DEVELOPMENT

THE U.S. NAVY'S SUBMARINE HYDRODYNAMICS/HYDROACOUSTIC COMMUNITY: A CASE STUDY IN STRATEGIC PLANNING FOR A DECENTRALIZED, MULTI- ORGANIZATIONAL, MILITARY COMMUNITY

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The United States Navy's submarine hydrodynamic/hydroacoustic community is a decentralized, multi-organizational, geographically distributed enterprise. Strategic planning and management, whether formal or ad hoc, is necessary for effective functioning of any organization. However, formal strategic planning is particularly difficult in multi-organizational, geographically diverse enterprises. Enterprise-wide performance measurement and a shared understanding of enterprise performance are necessary to devise compelling and effective strategies.

During the Cold War, the U.S. Navy's submarine force had a clear mission and compelling goals, with resulting clarity on performance metrics. The submarine hydrodynamic/hydroacoustic workforce was focused on helping the submarine force achieve these goals. In the post–Cold War era, the submarine force mission in the integrated battle space is less defined. The percentage of the military budget spent on discretionary spending is decreasing. The submarine hydrodynamic/hydroacoustic community is directly impacted by the recent lack of focus and budget reductions.

The purpose of this thesis is to research past processes used to perform strategic planning for the submarine hydrodynamic/hydroacoustic community, identify current strategic issues, and document strategic lessons learned, which are identified through the evaluation of product successes and failures.

KEYWORDS: Submarine, Hydrodynamics, Hydroacoustics, Survey, Ethnographic Interviews, Strategic Planning, Lessons Learned

MASTER OF SCIENCE IN SYSTEMS ENGINEERING

ONLINE ISLAMIC ORGANIZATIONS AND MEASURING WEB EFFECTIVENESS

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Master of Science in Systems Engineering–September 2004

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Experts estimate that websites maintained by various Islamic extremists have increased to hundreds in recent years. Innovative operational capabilities enabled by Internet technology certainly pose serious challenges to U.S. counterterrorism efforts. However, greater attention must be given to Islamic organizations that wage information campaigns, perpetuating resentment and discrediting the United States and her allies. While these sites may not openly call for violence, the sharing of common causes and goals with extremist organizations is worrisome. The repudiation of Western systems and global Islamization under the Shariah systems is often a transparent theme. The thesis applies a web-performance methodology commonly accepted in the commercial industry to evaluate the effectiveness of these websites at attracting and engaging audiences to promote their cause.

KEYWORDS: Information Campaign, Effectiveness, Terrorism, Islamic, Web, Internet

DESIGNING A FORCENET INFORMATION TOPOLOGY

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Master of Science in Systems Engineering–December 2004

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Network-centric warfare (NCW) is a theory of war that attempts to maximize the benefit of linking together, or networking, operating forces. The Navy and Marine Corps have decided to attempt to instantiate this war-fighting concept through FORCEnet. The FORCEnet concept is ambitious, but most current efforts seek to ensure the ability to connect and share data without addressing the larger picture of how to move information within a netted force to maximize the benefit of information sharing. This thesis presents an information topology developed to effectively share information across a variety of force compositions. In order to fully attain the benefits of a networked force, a complementary command-and-control system must also be designed. This thesis also outlines a command-and-control system that can be employed in a network-centric force.

KEYWORDS: Network-Centric Warfare, NCW, Net-Centric Operations, FORCEnet, Information Topology

SYSTEMS ENGINEERING

PROCESS ENHANCEMENT AND DATABASE SUPPORT FOR VEHICLE OPERATIONAL- READINESS REPORTING

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The U.S. Army uses a unit-readiness index to track the combat readiness of systems. The unit-readiness index relies on the accuracy of automated and manual testing of the hardware and related software of the line-replaceable units (LRUs) the system comprises. These tests are based on a GO/NOGO scenario. When an LRU fails, vehicle commanders and commanders up the chain of command can override this and continue with a mission. Overriding the NOGO recommendations produces a false combat-readiness status for the unit and creates a number of problems related to unit combat decisions as well as logistical support. This thesis introduces a new process for more effectively tracking combat readiness. It outlines some of the problems associated with the current GO/NOGO scenario and examines the current tests, artifacts, and data available from the current process. It proposes an additional report process and shows how this new process will eliminate the readiness-tracking problems associated with the GO/NOGO scenario. This thesis also presents the design of a vehicle database and master fault database to support the proposed process, and presents several sample reports generated from this master fault database.

KEYWORDS: Unit Readiness Index, Operational Readiness Index, M1A2 Abrams, Software Reliability, Performance, DoD, U.S. Army

DEVICE PROFILING ANALYSIS IN DEVICE-AWARE NETWORKS

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As more and more devices with a variety of capabilities become Internet-enabled, device independence becomes a big issue when the information requested needs to be correctly displayed. This thesis introduces the issue and compares how existing standards create a profile that describes the device capabilities to achieve the goal of device independence.

After acknowledging the importance of device independence, this thesis utilizes the idea to introduce a device-aware network (DAN). DAN provides the infrastructure support for device-content compatibility matching for data transmission. The major components of the DAN architecture and issues associated with providing this new network service are identified. A device-aware network improves network efficiency by preventing unusable data from consuming host and network resources. The device profile is the key to achieving this goal.

KEYWORDS: DAN, CC/PP, UPnP, RDF, DevInf

MASTER OF SCIENCE IN SYSTEMS-ENGINEERING MANAGEMENT

AN EXAMINATION OF THE NAVY'S FUTURE-NAVAL-CAPABILITY TECHNOLOGY-TRANSITION PROCESS

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Second Reader: Bernard Ulozas, Space and Naval Warfare Systems Command

The ability to transition technology developments to operational systems is of great importance to the Department of the Navy (DoN). One way to achieve increased transitions is to operate more efficiently, more “like a business.” Over the years, significant programmatic and policy changes have been introduced in the DoN. One of these changes was the initiation of a new science and technology (S&T) transition process for delivering new capabilities in a more focused manner, the future-naval-capability (FNC) process.

This thesis examines the FNC technology-transition process from a business-process perspective. A number of common business parameters are researched and used for comparison to the FNC process. The goals and objectives of the FNC process are documented and feedback is obtained from the stakeholder community. Although the FNC process is new and remains a work in progress, the results of this thesis reveal frustration and concern from all stakeholder communities regarding continued difficulties with the process in delivering new capabilities to the warfighter. In comparing FNC process parameters to those in the commercial sector, this research identifies areas where the FNC operations differ from the private sector. In those areas where useful comparisons are made, the FNC metrics fall short. To realize the increased transitions desired, fundamental changes are still needed.

KEYWORDS: Science and Technology, S&T, Future Naval Capability, Technology Transition, Innovation, Business Model, Business Processes

ANALYZING AND SHARING DATA FOR SURFACE-COMBAT WEAPONS SYSTEMS

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Second Reader: Walter Owen, Department of Systems Engineering

In this thesis, a tool used by managers in the AEGIS program to assess system performance during test and evaluation of the AEGIS combat-weapon system is presented. As combat weapon systems have become more complex, evaluation of system performance has relied more heavily on recorded test data. As part of the ongoing transformation of the Department of Defense, commercial off-the-shelf (COTS) technology is being integrated into the acquisition of combat weapon systems. An analysis control board (ACB) was created in response to these factors to support the AEGIS weapon-system program office. The focus of this ACB was to investigate and provide potential solutions to data dictionary, data recording, and data reduction (R2D2) issues to the AEGIS program manager. This thesis discusses the history of the R2D2 ACB and its past, present, and future directions. Additionally, this thesis examines how the R2D2 ACB concept could be applied to the DD(X) Next Generation Destroyer program.

KEYWORDS: Analysis Control Board, Data Dictionary, Data Recording, Data Reduction, Test and Evaluation, AEGIS

MASTER OF ARTS

**National Security Affairs
Security Studies**

MASTER OF ARTS IN NATIONAL SECURITY AFFAIRS

AN ANALYSIS OF THE 1964 JOHNSON LETTER: LESSONS FOR THE 2003 IRAQI CRISIS, TURKISH–AMERICAN RELATIONS AND GLOBAL-POWER/REGIONAL-PARTNER INTERACTIONS

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Master of Arts in National Security Affairs–December 2004

Advisor: Barak Salmoni, Department of National Security Affairs

Second Reader: Paul Pitman, Department of National Security Affairs

The dynamics in U.S.–Turkish relations in both 1964 and 2003 involved a large global power and a medium-sized regional power in the context of a global threat requiring regional cooperation. In both cases, the priority of the global power was the fight against the global threat, which created expectations from the medium power ally in the region, who in both cases had its own reservations about the issue, considering its own national interests.

Analysis of the 1964 crisis shows that both the U.S. and Turkey had five main sources of influence over their foreign-policy decisions leading to disagreement in 1964: the dynamics in the U.S.–Turkish relations as between a global power and a regional partner; domestic concerns of both countries; unaligned goals of the two parties; international circumstances; and the influence of signaling failures and previous interactions. When we analyze the 2003 crisis in light of these findings, we see that all the main issues seem to be consistently relevant, though their effects might have changed slightly.

Overall, both cases reveal that the above-mentioned five factors determine the outcome of interactions between large global powers and medium powers in the region.

KEYWORDS: Turkish–American Relations, Johnson Letter, Global Power, Medium Power, Regional Power, 2003 Iraq Crisis, U.S., Turkey, Foreign Policy Formation in Times of Crisis, Cyprus, Turkish Cypriots

NATO–RUSSIAN RELATIONS: STATUS AND PERSPECTIVES

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Master of Arts in National Security Affairs–December 2004

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Second Reader: Mikhail Tsyppkin, Department of National Security Affairs

Since the end of the Cold War, NATO has attributed great importance to the development of cooperation with Russia. This thesis evaluates the main developments in NATO–Russian relations since 1991. Although Moscow and the Alliance established a NATO–Russian Council (NRC) and initiated a qualitatively new relationship, Russia still needs to fulfill some requirements to catch up to Western standards. Russia's external relations and political, economic, and security factors internal to Russia will determine the future of the relationship. This thesis examines Russia's political development and the transformation of its economic system, and establishes the problems in its political and economic systems. It also examines Russia's problematic external relations in the region and their impact on the NATO–Russian relationship. The thesis reviews Russia's national-security concept and explores regional conflicts such as those in Chechnya and Georgia, and the U.S.–NATO presence in Central Asia. Oil- and natural-gas-transportation problems created by the Russian monopoly are examined, and Russian technology transfers to Iran, particularly in the nuclear sector, are evaluated. The thesis also evaluates the internal and external interactions mentioned above and offers conclusions about the prospects for security and stability in Europe.

NATIONAL SECURITY AFFAIRS

KEYWORDS: NATO, Russia, European Security, United States, Georgia, Chechnya, Iran, Central Asia, OSCE, National Security, Pipeline, Foreign Policy, Democracy, Economic Transformation, Poverty, National Interest, Nuclear Technology

TRANSFORMATION OF THE ISRAELI DEFENSE FORCES: AN APPLICATION OF THE U.S. MILITARY TRANSFORMATION?

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Second Reader: James Russell, Department of National Security Affairs

The thesis studies the Israeli Defense Forces' (IDF) transformation in the context of U.S. military transformation. The thesis argues that the uniqueness of the U.S. military transformation does not prevent other militaries from applying relevant concepts and considers the IDF a good candidate for such a demonstration. The thesis explores the U.S. military transformation as a beneficial model in the IDF's continuing transformation and studies the IDF from many perspectives to identify the transformational imperatives and the relevance of current IDF transformational efforts. The primary areas of interest are the Israeli security environment, societal transformation, and the features of the IDF's transformational efforts. This thesis identifies weak points in both the U.S. military transformation and the IDF's current organization; examination of the IDF's transformation in relation to that of the U.S. reveals similarities between the two. Recommendations are provided for the IDF and, to a lesser extent, the U.S. military.

KEYWORDS: U.S. Military Transformation, Israeli Defense Forces, Military Threats to Israel

EXPLAINING DOMESTIC INPUTS TO ISRAELI FOREIGN AND PALESTINIAN POLICY: POLITICS, MILITARY, SOCIETY

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Second Reader: James Russell, Department of National Security Affairs

Advancing the peace process between Israel and the Palestinians is of great interest to the United States. To this aim, an understanding of the main factors involved in Israel's foreign policymaking is needed. This thesis shows that internal pressures are most significant and assesses the influence of domestic access points to Israel's Palestinian policy. Three areas are discussed for a complete and current analysis of Israel's policymaking process: 1) the fundamentals that characterize Israel's political system, such as the Knesset, political parties, ruling coalition and prime minister, 2) the role of the Israeli Defense Forces and the balance in civil–military relations, and 3) the mixture of players that color Israel's societal landscape, including subcultures, interest groups, and public opinion. The key finding is a combined ranking of the most important domestic forces driving Israel's Palestinian-policy formation in all three areas.

KEYWORDS: Israel, Foreign Policy, Palestinians, Politics, Military, Society, Peace Process, Prime Minister, Political Parties, Coalition, Civil-military Relations, Subcultures, Interest Groups

NATIONAL SECURITY AFFAIRS

NATO: CONTINUITY AND CHANGE—THE ATLANTIC ALLIANCE AS AN INSTITUTION, ORGANIZATION, AND FORCE BY REFERENCE TO ARTICLES 4, 5 AND 6 OF THE WASHINGTON TREATY

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This thesis examines the evolution of NATO as an institution in the international system by referencing Articles 4, 5 and 6 of the Washington Treaty of 1949. Initially, the thesis approaches and studies NATO from an international-relations perspective. It then examines the institutional evolutionary process of the alliance since inception and implementation in 1949 and explores the significance and meaning of the aforementioned articles. This thesis utilizes the case-study method and refers to four distinct events that shaped allied policies and strategies: the Suez crisis of 1956, the establishment of the politico-military consultation process, the Yom Kippur War and the end of the Cold War. It also examines allied policies after the events of September 11, 2001 and identifies a general pattern of events pertinent to crisis creation inside NATO when the organization is facing a defense issue outside the Euro-Atlantic area. Finally, the thesis concludes that NATO is not an ordinary military alliance, as evidenced by its longevity, agility, and adaptability, which allows the alliance to maintain a central position in the international system as a robust politico-military organization.

KEYWORDS: NATO, Atlantic Alliance, Suez Crisis, Yom Kippur War, Out-of-area Operations, End of Cold War, Three Wise Men, Afghanistan, Political Consultation, Article 4, Article 5, Article 6, North Atlantic Treaty, Crisis

NATO, GREECE, AND THE 2004 SUMMER OLYMPICS

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Since the end of the Cold War, the NATO alliance's transformation has erased doubts about its survival. NATO continues to adapt to new threat environments by expanding its mission scope to out-of-area operations and by assuming new security missions. For the 2004 Summer Olympics in Athens, Greece, the 11 September 2001 terrorist attacks against the United States and subsequent 11 March 2004 Madrid bombings in Spain complicated an already robust Greek security plan.

Greece's extensive security planning, in addition to coordinating NATO support, highlighted the challenges and readiness requirements for the alliance in the 21st century. Terrorist concerns, burden-sharing, recognition of Greek sovereignty, political limitations in deploying NATO's chemical, biological, and radiological-defense (CBR) team and response-force (NRF) utilization were elements of the challenges faced in security preparation for the games.

In assessing the dynamics behind NATO's history and its security participation in the 2004 Summer Olympics, this thesis serves as a case study of the continuing transformational role and adaptability of NATO. Overall, the alliance's willingness to assume security support for a major international sporting event reflected its longtime relationship with Greece, ability to perform significant security missions, and commitment to and solidarity with its allied members.

KEYWORDS: NATO, Alliance, Transformation, Olympics, Games, Greece, Security, Terrorism, 17N, AWACS, Sovereignty, Burden-Sharing, Truman Doctrine, Cyprus, Karamanlis, Strategic Concept, Solidarity, Public Opinion, 11 September 2001, 11 March 2004

NATIONAL SECURITY AFFAIRS

THE PHILIPPINE INSURRECTION: THE U.S. NAVY IN A MILITARY OPERATION OTHER THAN WAR, 1899-1902

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U.S. naval doctrine has been dominated by the Mahanian concept of massing large capital ships for over a hundred years. Yet it was a Cyclone-class patrol craft, a U.S. Coast Guard cutter, and an Australian frigate that pushed up the Khor-Abd-Allah waterway and opened up the port of Umm Qasr, Iraq, during the Second Gulf War. These ships continue to protect the port and the surrounding oil infrastructure from insurgent and terrorist attack today. With the Navy's current interest in transformation, the question arises whether the Navy as presently configured is well suited for today's threats. This thesis explores how the Navy should meet threats to national interests. This is accomplished through historical analysis of an event similar to the situation today: the Philippine Insurrection (1899-1902). This episode showcases the shortcomings of the Navy's conventional approach to military operations other than war, and the need for change. In today's asymmetric environment, the past provides insight into effective means for handling this type of threat. This thesis concludes that the Navy needs to diversify to incorporate different ship platforms that integrate the utility of the old with the technology of the new.

KEYWORDS: Navy, Philippines, Insurrection, Gunboats, Guerilla Warfare, Blockade, Asymmetric Warfare, Pacification, Army

SOFT POWER AND ITS IMPACT ON U.S. INFLUENCE IN LATIN AMERICA

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The role of Latin America in U.S. foreign policy has ebbed and flowed for over 100 years. Over the last fifteen years, the relationship between the United States and Latin America has seen a precipitous drop in both cooperation and cordiality. Additionally, the United States has seen a definitive shift to the left in Latin American politics over the last several years, Uruguay being the most recent example. The amicable relationships that the United States once enjoyed with Brazil and Venezuela have become acrimonious. With the United States' increased interest in completing a Free Trade Area of the Americas agreement by January 2005, good relations with Brazil are vital. The United States' continued dependence on imported petroleum from Venezuela and America's concern over Venezuela's growing relationship with Cuba make this country important to U.S. foreign policy.

This thesis focuses on the United States' ability to use its cultural influence (soft power) to positively affect U.S. relations with Brazil and Venezuela. By analyzing past and present effects of U.S. cultural influence in these countries, the U.S. can better understand and appreciate the influence it wields as the world's only remaining superpower. This thesis finds that despite historic evidence, the U.S. has had and continues to have a propensity to use soft-power influence tactically, diminishing the effectiveness of its innate power and influence as the global leader in military, economic, cultural, and technological matters. Conversely, the U.S. attempts to use its hard power (military and economic) strategically, thereby breeding anti-Americanism globally.

This thesis concludes that the United States' ability to influence entire cultures merely by "being" is a force it needs to better understand and utilize. To successfully encourage a hemispheric free-trade agreement and continue favorable relations with one of its main petroleum suppliers, the United States needs to rethink its political relationship and foreign diplomatic approach throughout the region. How the United States chooses to approach these issues will determine whether its regional influence helps promote free trade and enhance democratic ideals or, to the contrary, increases regional tensions.

KEYWORDS: Brazil, Venezuela, Latin America, Cuba, Soft Power, Hard Power, Culture, Cultural Influence, Anti-Americanism, Latin American Foreign Relations, U.S. Foreign Policy, Latin American Foreign Policy

POLITICAL IMPACT OF STRATEGIC BASING DECISIONS

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Second Reader: Richard Hoffman, Department of National Security Affairs

Relationships between the United States and its worldwide network of allies have, since the inception of NATO, greatly revolved around the United States' ability and desire to permanently station troops overseas. Since 1941, the United States has entered into these basing agreements for a variety of strategic and sometimes political reasons. From NATO's inception, and as the cornerstone of its defensive structure, the United States has combined the idea of sending troops to different regions of the world with a global basing strategy founded on the concepts of overlapping protection and deployability. At times, to gain access to areas of strategic interest, the United States has offered aid and economic assistance along with a military presence. In other cases, positively affecting the political climate of the country was the stated goal of troop presence. This thesis examines the effects of basing in Greece and Spain to uncover lessons learned which might be applied to the new U.S. global-basing plan and current troop-positioning activities in Kyrgyzstan. In both cases, the United States worked with openly dictatorial governments for the purpose of basing and did not foster the long-term political situation initially desired.

KEYWORDS: Basing, Greece, Spain, Kyrgyzstan, Military Basing Policy, Marshal Plan, Long Term Basing Policy, Lily Pad Basing Plan, Junta, Franco, Eisenhower, Central Asia, Europe, Western Europe, U.S. Basing Strategy

REVISING U.S. GLOBAL MILITARY-BASING POLICY: IS A PERMANENT U.S. MILITARY PRESENCE STILL REQUIRED?

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This thesis examines U.S. policy for employing military forces across the globe. The major transformational trends in improving U.S. military capabilities over the past two decades and the changing international security environment have impacted the way in which American leaders focus on the global military-posture strategy. The American military interventions in Iraq, Kosovo, and Afghanistan help determine whether the United States has demonstrated true global-reach capability without the advantage of permanent forward operating bases. The Philippines–U.S. relationship provides an opportunity to assess whether the United States has demonstrated the capability and commitment to defend its national interests and its ally and to maintain peace and stability despite the removal of major U.S. bases. U.S. capability and commitment may allow greater flexibility in choosing alternatives to the current policy of permanent forward basing around the globe.

KEYWORDS: Military Force Posture, Forward Presence, Transformation, Capabilities, Commitment, Forward Operating Bases, Basing Strategy, Northeast Asia, Japan, Korea, Philippines, Guam, Threats, Allies, Global Presence

NATIONAL SECURITY AFFAIRS

FROM INDEPENDENCE TO ALLIANCE: NATO IMPACT ON THE LATVIAN SECURITY ENVIRONMENT IN THE POST-COLD WAR ERA

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The collapse of the Soviet Union and the associated end of global confrontation has resulted in a dynamic process of change that has transformed the entire security situation in the Baltic Sea region.

Recognizing that NATO is becoming an organization able to extend stability and security throughout all of Europe, Latvia considers membership in NATO a key to the solution of the Baltic security dilemma.

This thesis examines the influence of NATO institutions on the Latvian security environment in advance of Latvia's full-fledged membership into NATO. The analysis is particularly concerned with the gradual growth of various NATO-cooperative institutions by which NATO will extend its influence in strengthening security and stability in the Baltic Sea region.

The analysis concludes that NATO's involvement with Latvia has had many positive effects, including increased security, transformation of armed forces, and creation of a new framework in Latvian-Russian relations.

KEYWORDS: Latvia, NATO, Latvian National Armed Forces

TERRORISM, DIASPORAS, AND PERMISSIVE THREAT ENVIRONMENTS: A STUDY OF HIZBALLAH'S FUNDRAISING OPERATIONS IN PARAGUAY AND ECUADOR

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In this thesis, a framework to identify where and how Hizballah conducts fundraising in Latin America is developed. The focus of this analysis is how host-nation characteristics, geostrategic variables and diaspora characteristics influence the nature and significance of Hizballah's fundraising operations in Paraguay and Ecuador. In Paraguay, operations are shaped by favorable geostrategic variables, host-nation characteristics, and diaspora characteristics; predictably, Hizballah employs a wide range of fundraising operations in Paraguay, producing substantial profits. Geostrategic variables and host-nation characteristics facilitate fundraising operations in Ecuador as well; however, Hizballah likely tailors its fundraising operations to mitigate the influence of unfavorable diaspora characteristics and maximize the potential of favorable host-nation characteristics and geostrategic variables.

KEYWORDS: Terrorism, Terrorist Fundraising, Hizballah, Latin America, Ecuador, Paraguay

THE DOMESTIC, REGIONAL, AND GLOBAL SECURITY STAKES IN KAZAKHSTAN

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This thesis examines the evolution of Kazakhstan's security policies since its independence, and particularly after 11 September 2001, indicating that the country has chosen to play an active role in regional and international security as a means of securing its own national interests. Kazakhstan has opened to the West and plays an active role in the War on Terrorism and works to maintain Central Asia's regional-security architecture. It is asserted that these policies have had some demonstrable effect on national,

regional, and international security, but as a young state in a troubled region, Kazakhstan requires increased Western assistance if it is to become a force for stability.

Kazakhstan has an important location geopolitically and can play the role of regional leader in Central Asia, but it is still a young state needing strong support. “Perhaps nowhere was the granting of independence more bittersweet and the challenges of sustaining it more complex than in the case of Kazakhstan.” (Mathews, Jessica T., Foreword in “Kazakhstan: Unfulfilled Promise,” Olcott, Martha Brill, Carnegie Endowment for International Peace, Washington D.C., 2002)

KEYWORDS: Kazakhstan, Central Asia

THE FUTURE OF MERCOSUR

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With the absence of a bipolar international system and the rise of globalization, there are two tracks of foreign diplomatic and economic policy that nation-states can pursue. These tracks can be competing or complementary. The first is global integration; the second, regional integration (of which the European Union is the best example today).

Latin America also faces a choice in its future. Mercosur, the “Common Market of the South,” is an economic initiative that offers the promise of economic development. Begun in 1991 as an agreement between four nations in the Southern Cone, Mercosur made large gains in regional trade during its initial years. As the global economy began lagging at the turn of the century, proponents for Mercosur have had a more difficult time arguing its benefits. Should Mercosur survive the test, it could emerge stronger and continue to expand along the same lines politically and militarily as the European Union.

This thesis opens by examining the evolution of Mercosur compared to the model of the European Union. The next chapter focuses on the problems faced by the Common Market since its inception and how the actors have dealt with those problems. It offers corrective steps necessary for the project to succeed. The final chapter focuses on economic nationalism. What is it, and will it derail Mercosur? The conclusion summarizes the arguments made and makes a prediction on the future of Mercosur.

KEYWORDS: Mercosur, Brazil, Argentina, Regional Integration, South America, Economics, Liberal Market Reform

NATIONAL SECURITY AFFAIRS

IRAQ AND FAILURES IN U.S. COMPELLENCE POLICY 1990-2003

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This thesis explores failures in U.S. compellence policy in Iraq from 1990 to 2003. In order to measure U.S. compellence failures in Iraq, an evaluation of mechanisms of compellence policy, such as key actors, operations, and treaties is presented. Political, social, and economic levels of effectiveness in terms of U.S. misperception are also assessed. Why is compellence policy an impractical method in U.S.–Iraqi relations? Why did U.S. compellence policy in Iraq succeed on some levels and not others? Why is compellence policy a counteractive strategy for the United States to embrace in the twenty-first century?

KEYWORDS: Coercion, Compellence, Deterrence, Iraq, No-Fly Zone, Perception and Misperception, Images

THE EVOLUTION OF JAPAN’S CONSTITUTION AND IMPLICATIONS FOR U.S. FORCES ON OKINAWA

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Okinawa serves as a strategic base for U.S. forces in maintaining regional security and protecting Japanese and American interests, based on the 1960 Treaty of Mutual Cooperation and Security between Japan and the United States and its 1951 predecessor. This thesis assesses developing factors in Japan’s constitutional debate after the terrorist attacks of September 11, 2001, examines the myriad issues influencing the reinterpretation, or potential revision, of Article 9 of Japan’s constitution, and assesses the implications revision would have on Japanese-based U.S. forces stationed primarily in Okinawa.

This thesis argues that Tokyo’s reinterpretation or revision of Article 9 would not require a major withdrawal of U.S. forces from Okinawa. Regional threats still validate the half-century-old U.S.–Japan Security Alliance and most of its current structure. The major questions addressed in this thesis are how and why Japan is reinterpreting or revising its constitution, what dangers threaten Japanese and American security and interests, and how Okinawa’s bases contribute to the security and stability of the region—and at what price. Furthermore, this thesis evaluates the validity of perceptions regarding U.S. troops on Okinawa and seeks to clarify the Okinawan situation.

The arguments outlined in this thesis set the stage for a policy-prescriptive conclusion that is predicated on six premises. A major point is the validation of a viable and proven U.S. expeditionary force remaining stationed within Japan. Practical recommendations are offered regarding what is next for U.S. forces on Okinawa, including maintaining the status quo with certain adjustments, overhauling public relations and media interactions, and examining the merits of Kadena Air Base and Ie Island for the relocation of Marine Corps Air Station Futenma.

KEYWORDS: Evolution, Japan’s Constitution, Implications, U.S. Forces, Okinawa

NATIONAL SECURITY AFFAIRS

POLISH LAND FORCES OF THE XXI CENTURY: REFORMS IN ACCORDANCE WITH THE CURRENT REVOLUTION IN MILITARY-AFFAIRS TRENDS

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The end of the Cold War and the September 11, 2001 attacks changed the strategic environment of the world. New sociopolitical realities increased the use of armed forces. The War on Terrorism brought the necessity of expeditionary warfare even to countries whose security doctrine had till then been exclusively focused on territorial defense. Poland is one such country. New requirements after 1999 necessitated reforms in the armed forces of Poland, and because expeditionary warfare has never been practiced, reforms need to be strongly coordinated with such military forerunners as the U.S. Army.

This thesis presents a study of contemporary war and its effects on force structure. It also shows how the U.S. Army has reacted to the changing character of warfare. Reforms such as the Stryker brigades, Army XXI, and the “Army After Next” program are analyzed to assess which solutions can be used in Polish Army reforms. The current capabilities of the Polish Army are also assessed in order to judge the background for military reforms in Poland. Finally, recommendations are made for reforms in the Polish Army.

KEYWORDS: Polish Army, Revolution in Military Affairs, Military Transformation, Military Reforms

ARCHITECTURE AND POLITICS IN CENTRAL EUROPE

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Architecture and political power have been related throughout history in various ways. This thesis argues that in the political realm, the most prominent function of architecture, as well as of other aesthetics, has been to raise the national sentiment of a people. The aesthetics of architecture can be used to sell the ideas of a political system to the populace both by the creation of new architecture and the destruction of symbols contrary to polity. The vehicle by which politics and architecture interrelate is shown to be the rhetoric surrounding buildings; an example is the nationalist period of Europe, when characters such as Stalin and Hitler manipulated aesthetics to develop national sentiment. Hence, in newly democratic Prague and Berlin, a change in architecture and a debate on the national value of styles is seen, though the styles in each case were not the same. It is shown that architectural style does not reflect a specific political theory, and national sentiment is the key way in which architecture and politics relate.

KEYWORDS: Architecture-Political, Architecture and Politics, Architecture-Post-Communist, Aesthetics and Politics, Architecture-Post-Communist-Prague, Architecture-Post-Communist-Berlin

MASTER OF ARTS IN SECURITY STUDIES

TRUST AND INFLUENCE IN THE INFORMATION AGE:

Operational Requirements for Network-centric Warfare

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Military leaders and scholars alike debate the existence of a revolution in military affairs (RMA) based on information technology. This thesis shows that the information RMA not only exists, but will reshape how forces for the 21st century are planned, operated, educated, organized, trained, and equipped.

This thesis introduces the communication-technology (CommTech) model to explain how communication technologies affect organizations, leadership styles, and decision making. Due to the growth in networking enterprises, leaders will have to relinquish tight, centralized control over subordinates. Instead, they will have to perfect their softer power skills such as influence and trust as they embrace decentralized decision making.

Network-centric warfare, self-synchronization, and network-enabled operations are concepts that provide the framework for integrating information technology into the battlespace. The debate that drives centralized versus decentralized control in network operations is analyzed with respect to the CommTech model. A new term, “operational trust,” is introduced and developed to explore easier ways to build trust among network entities. Finally, the thesis focuses on what leaders need to do to shape network culture for effective operations.

KEYWORDS: Information RMA, Network-Centric Warfare, Communications Technology Model, Trust, Network Enabled Operations, Centralized Control, Influence, Self-synchronization, Decision-making, Leadership, Operational Trust, Decentralized Execution

COUNTERINSURGENCY: THE ROLE OF PARAMILITARIES

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This thesis examines the role of paramilitary forces in the counterinsurgency operations launched by the armed forces of the Philippines (AFP) against the Communist Party of the Philippines (CPP) and the New People’s Army (NPA). The Philippine government and the AFP firmly believe that the present Civilian-Armed-Force Geographical-Unit Active Auxiliary (CAA) is an essential component of the AFP’s operational clear-hold-support methodology.

Many scholars argue that separating communist guerrillas from the populace is an important element in winning the counterinsurgency campaign. Isolating communist insurgents is achieved through the creation of local militia. However, some authors contend it would be dangerous for a government to train paramilitary forces because, in the long term, governments are unsure of the future loyalties of paramilitary forces. They may currently work for the government, but as they gain skills, these paramilitary forces could use their training against the government, making it dangerous to train paramilitary forces.

Philippine paramilitaries are good examples of paramilitary forces used effectively in counterinsurgency. Their primary task of protecting communities and persons from the coercion and abuse of communist insurgents is well achieved. They are effective because of proper training as well as command and control. This thesis concludes that the Philippine government and the AFP are headed in the right direction operationally for using paramilitary forces for village defense and as protectors of the people and that Philippine paramilitary forces need proper training as well as command and control to be effective.

KEYWORDS: Paramilitary Forces, Counterinsurgency Operations, The Philippines, Armed Forces of the Philippines, AFP, Communist Party of the Philippines, CCP, New People's Army, NPA, Civilian Armed Force Geographical Unit Active Auxiliary, CAA, Paramilitary Forces, Counterinsurgency Forces

THE PHILIPPINE RESPONSE TO TERRORISM: THE ABU SAYYAF GROUP

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The emergence of the Abu Sayyaf group (ASG) in the early 1990s represented the radicalization of the Filipino-Muslim separatist movement. Despite the initial success of the joint Philippine and U.S. Balikatan exercise against the Abu Sayyaf on 2002, the ASG continues to carry out attacks on lightly guarded or soft targets, as international terrorist groups are known to do. The anarchic region of Central Mindanao has become a training base for Southeast Asian terror organizations and a refuge for Abu Sayyaf. The War on Terrorism has changed the lives of Filipinos and strained the capacities of the government. Over the years, the Philippines has fought terrorism in many ways. It has retaliated militarily, prosecuted terrorists, preempted terrorist attacks, implemented defensive measures, and addressed some of the causes of terrorism. To some degree, all suffer from limited effectiveness and applicability. This thesis analyzes the Philippine response to terrorism and determines how to develop an effective strategy to counter terrorism. This study also discusses the governmental organizational structure and problems faced by Philippine agencies in addressing the terrorism posed specifically by the Abu Sayyaf. In addition, this thesis presents a case study of Abu Sayyaf by analyzing its organizational and operational tools for maintaining its terrorist capability and examines the Philippine bureaucracy's ability to respond to terrorist threat.

KEYWORDS: Abu Sayyaf Group, ASG, Philippines, Terrorism, Counterterrorism, Al Qaeda, Jemaah Islamiya, Moro Islamic Liberation Front, MILF, Mindanao

THE GREEK–TURKISH RAPPROCHEMENT PROCESS, 1999–2004: PARADIGM SHIFT OR EPIPHENOMENON?

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This thesis examines the ongoing Greek–Turkish rapprochement. The latest effort closely followed two devastating earthquakes that hit Greece and Turkey in 1999. The two nations sent official and private (NGO) relief help, including search-and-rescue teams, to the areas struck. This study examines whether there are tangible shifts in the policies of the two countries that could sustain their rapprochement or whether the adjustment is superficial, and could collapse as soon as any controversial issue arises. It approaches the question with the clarity provided by hindsight, employing three case studies of similar endeavors of the two countries. By examining the three past cases as well as considering all empirical evidence for the present rapprochement, this thesis concludes that there is tangible evidence of a shift in Greek foreign policy towards Turkey. With respect to Turkish policy, there exists encouraging rhetoric and

gestures, but no evidence of adequate reciprocity towards Greece on the political level. Finally, the thesis provides policy recommendations for both sides.

KEYWORDS: Greek-Turkish Relations, Rapprochement, Ataturk, Venizelos, Papandreou, Ozal, Cem, Earthquake-diplomacy, Greek Foreign Policy, Turkish Foreign Policy, European Union-Turkey Relations, Policy Shift, Rapprochement

MARITIME STRATEGY IN PAKISTAN

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Though a maritime nation, Pakistan has not been able to effectively exploit the sea and its resources. Decades of neglect have hampered the development of the maritime sector, which in turn has hurt both economic growth and the national security of the country. While seaborne trade is the backbone of Pakistan's economy, domestic shipping and shipbuilding industries are in disarray, and the exploitation of offshore natural resources is restricted to coastal fisheries. Despite its animosity with neighboring India, Pakistan has, until recently, relied on two co-located ports at Karachi, which would be vulnerable targets in any war. The continental mindset of policymakers has affected the development of the Pakistani Navy as an effective element of military strategy.

This thesis argues that development of the maritime sector is important for both economic growth and the national security of Pakistan. In economic terms, the maritime sector can diversify the economic base and stimulate Pakistan's economic growth. The development of the Pakistani Navy, both as a credible conventional and strategic force, is important for protection of growing maritime economic interests against predation and coercion, and also necessary to safeguard the strategic interests of the country.

KEYWORDS: Pakistan, Maritime Strategy, Shipping, Ports, Pakistani Navy, Second-strike Capability

INTERNAL SECURITY THREATS TO PAKISTAN

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Ethnicity, sectarianism, and economic instability are fundamental variables of internal security threats to Pakistan. Religious extremism has created an unenviable image of Pakistan in the eyes of the rest of the world and has affected the country adversely. At the same time, inter-provincial grievances could potentially cause serious damage to the Pakistani federation. Despite recent economic recovery and sound policies, the absence of genuine socioeconomic development has provided ethno-sectarian elements and regional forces grounds to exploit and weaken Pakistan internally.

This paper argues that ethno-sectarian problems are major security threats to Pakistan and will remain a huge impediment to the achievement of economic prosperity. Interdependence of these multifaceted threats and their overall impact on internal security is the focus of this analysis. Pakistan needs to address these national-security threats and find a viable solution in a reasonable timeframe to find its rightful place in the community of modern nations. The immediate requirement is to introduce political, economic, and educational reforms and take bold initiatives to obviate present and future threats. This paper recommends a three-pronged strategy to counter ethno-sectarian threats to Pakistan: halt, then reverse present trends; enforce rule of law; and introduce fresh incentives for socioeconomic development.

SECURITY STUDIES

KEYWORDS: Ethnicity, Provincialism, Sectarianism, Jihadi Culture, Economic Instability, Interdependence of Economy and Internal Security, State Institutions, Police, Paramilitary

THE COMMUNIST INSURGENCY IN THE PHILIPPINES: PRESENT STATUS AND FUTURE PROSPECTS

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The Philippines is the only country in Southeast Asia beset with a long-running communist insurgency. Since 1969, the Maoist Communist Party of the Philippines (CPP) and its military armed force, the New People's Army (NPA) have been fighting to overthrow the government of the Republic of the Philippines (GRP) and establish a Marxist state. Meanwhile, the GRP, under five administrations, has been fighting the communists, with so many lives and resources sacrificed and wasted, to no avail. After more than three decades of fighting, neither side can claim victory. The CPP/NPA continues to be a potent force, considered by the GRP as the primary threat to national security. How the CPP/NPA manage to survive despite the different counterinsurgency strategies adopted by the GRP is the subject of this thesis.

KEYWORDS: Insurgency, Counterinsurgency

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